Discourses of Energy Justice: The Case of Nuclear Energy

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I, Kirsten Jenkins, hereby certify that this thesis, which is approximately 79,800 words in length, has been written by me, and that it is the record of work carried out by me, or principally by myself in collaboration with others as acknowledged, and that it has not been submitted in any previous application for a higher degree.

I was admitted as a research student in September 2013 and as a candidate for the degree of Doctor of Philosophy (Science Faculty), Geography and Geosciences in October 2016; the higher study for which this is a record was carried out in the University of St Andrews between 2013 and 2016.

I, Kirsten Jenkins, received assistance in the writing of this thesis in respect of grammar, which was provided by Mr Paul Jenkins and Dr Graham Hambley.

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Abstract

The energy sector faces sustainability challenges that are re-working the established patterns of energy supply, distribution and consumption (Anderson *et al.* 2008; Haas *et al.* 2008; Stern 2008; Shove and Walker 2010). Amidst these challenges, socio-technical energy transitions frameworks have evolved that focus on transitions towards decarbonised, sustainable energy systems (Bridge *et al.* 2013). However, the 'socio-' or social is typically missing as we confront climate and energy risks in a moral vacuum (Sovacool *et al.* 2016). The energy justice framework provides a structure to think about such energy dilemmas. However, the full extent and diversity of justice implications within the energy system have been neglected. Thus, borrowing from and advancing the framework this research explores how energy justice is being articulated with attention to three emergent areas of growth, the themes of: (1) time, (2) systems component and (3) actor. It does so through a case study of nuclear energy, which was chosen because of its points of enquiry with regards to these three areas of growth, and its historical and on-going importance in the UK energy mix. Using results from 36 semi-structured interviews with non-governmental organisations and policy actors across two case studies representative of the nuclear energy stages of energy production and of waste storage, disposal and reprocessing – the Hinkley Point and Sellafield nuclear complexes – this research presents new insights within each of these previously identified areas of development. It offers the contributions of (1) facility lifecycles, (2) systems approaches and (3) the question of 'justice by whom?' and concludes that the energy justice framework can aid energy decision-making in a way that not only mitigates the environmental impacts of energy via socio-technical change, but also does so in an ethically defensible, socially just, way.

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Acronyms

AGR – Advanced Gas-cooled Reactor

BNFL – British Nuclear Fuels Limited

BWR – Boiling Water Reactor

CORE – Cumbrians Opposed to Radioactive Environment

CoRWM – Committee on Radioactive Waste Management

DA – Discourse Analysis

DECC – Department of Energy and Climate Change

DEFRA – Department of Environment, Food and Rural Affairs

EDF – Électricité de France

GDF – Geological Disposal Facility

GLEEP – Graphite Low Energy Experiment Pile

LWR – Light Water Reactor

MLP – Multi-Level Perspective

MRWS – Managing Radioactive Waste Safely (siting process)

MWe – Megawatt Electricity

NDA – Nuclear Decommissioning Authority

ONR – Office for Nuclear Regulation

PWR – Pressurised Water Reactor

RWMAC – Radioactive Waste Management Advisory Committee

RQ – Research Question

SC – Social constructivist

STS – Socio-Technical System

THORP – Thermal Oxide Reprocessing Plant

WAGR – Windscale Advanced Gas-Cooled Reactor

Chapter 1: Introduction

The energy sector faces serious sustainability challenges that are re-working the established patterns of energy supply, distribution and consumption and have led to the widespread acknowledgement that our current ways of life and consumption patterns are unsustainable (Anderson *et al.* 2008; Haas *et al.* 2008; Stern 2008; Shove and Walker 2010). Amidst these challenges, energy transitions frameworks have evolved that focus on the desire to transition towards decarbonised, sustainable energy systems that provide both security of supply and universal access to energy; a process that it is widely acknowledged will require new ways of producing, living and working with energy (Bridge *et al.* 2013; IEA 2008; Mernier 2007). In aiming for a socio-technical fix, governments are increasingly utilising the language of transitions, and the concept has begun to feature in the energy policies of countries including Denmark, Switzerland and the United Kingdom (UK) (Foxon 2013; Lovell 2007; Bolton and Foxon 2015).

However, the 'socio-' or social element is frequently missing from such transitions frameworks as most of us confront climate and energy risks in a moral vacuum (Sovacool *et al.* 2016; Jamieson 2014; Markowitz and Shari 2012; Swilling and Annecke 2012; Newell and Mulvaney 2013; Goldthau and Sovacool 2012). Eames and Hunt (2013) draw attention in particular to the fact that considerations of equity and justice are neglected within the socio-technical transitions literature and the wider energy transitions debate, despite the fact that the concept of sustainable development, the target of many transition plans, is inherently rooted in these core notions (Hopwood *et al.* 2005). Such failures include, but are not limited to, inattention to the burdens of having too much energy, including waste, over-consumption and pollution, or from not having enough, where some individuals lack access, are challenged by under-consumption and poverty, and may face health burdens and shortened lives as a consequence of restricted energy choices (Sovacool

et al. 2016). This research is concerned with the moral vacuum in energy decision-making.

In a bid to explore and understand the failures of our energy systems and the resultant challenges they produce, a range of conceptual frameworks have emerged. Each framework (which is inevitably contested) attracts a different emphasis on the content and purpose of energy research, as outlined originally by Jenkins *et al.* (2016a). Energy security assesses (a) the security of supply and production, and (b) emergent insecurities (such as availability and pricing), with a view to promoting the safeguarding of energy supply and 'indigenous' production capabilities (Ang *et al.* 2015; Mansson *et al.* 2014). Fuel poverty on the other hand, scrutinizes energy vulnerabilities in communities in order to shed light on distributional unfairness and reduce such inequity with regards to a person's ability to access and consume energy (Middlemiss and Gillard 2015). Energy justice, the focus throughout this research, takes a more broad-ranging approach as it evaluates (a) where injustices emerge, (b) which affected sections of society are ignored, and (c) which processes exist for their remediation in order to reveal and reduce such injustices. In focusing on the role of the energy justice concept in meeting the challenges outlined above, this thesis seeks to fill the emergent moral vacuum (at least partially) as it makes a case for the concept of energy justice as a tool that can help energy decision-makers to not only mitigate environmental impacts of energy production via socio-technical change, but also to do so in an ethically defensible, socially just, way.

1.1 Research Structure

This study explores the multi-level perspective (MLP) on socio-technical systems, the major transitions framework in Europe, which is frequently used to emphasise structural innovations in energy systems (Bridge *et al.* 2013). The MLP takes the form of a series of nested levels; the niche, regime, and landscape, which offer analytical and heuristic concepts to aid the understanding of socio-technical transitions (Geels

2002, 2010). Researchers focus on how these levels interact to produce both stability and change, often with a particular focus on radical evolution of the system (Whitmarsh 2012). However, whilst much of the existing literature on socio-technical systems has been dedicated to understanding niche innovations (Kemp *et al.* 1998; Lopolito *et al.* 2010; Smith and Raven 2012), this has come at the expense of understanding landscape dynamics, the top of the three theoretical levels of the MLP. This research contends that it is within the overarching landscape of socio-technical change that issues of energy justice emerge. It advances the energy justice framework as a means of integrating social justice concerns into energy transitions literatures and models, where inattention to social justice issues can cause injustices, or alternatively via their inclusion can provide a means to solve them. This thesis represents the first research to explicitly combine the socio-technical systems and energy justice literatures.

Within the broader context of the socio-technical systems literature, the research introduces, critiques, and reconceptualises the theory of energy justice as it stands to date, assessing if and in what form its core tenets of distributional justice, justice as recognition and procedural justice emerge in practice (McCauley *et al.* 2013). It is amongst the first to advance a whole-systems perspective on energy justice (Jenkins *et al.* 2014; Hall *et al.* 2013; van der Horst and Evans 2010; Adams *et al.* 2012; Hiteva 2013; Harrison 2013), thus making a contribution to the concept's development and to the field of energy geographies more generally. Further, it is the first to take an explicitly elite focus as it considers how elite organisations and individuals – those understood to hold more power, privilege and political influence than lay populations in energy decision-making – articulate energy justice[1]. The literature on energy justice to date has focused on a number of key social groups, including the fuel poor (Middlemiss and Gillard 2015; Chard and Walker 2016; Hiteva 2013; Teller-Elsberg *et al.* 2016; Walker and Day 2012), disabled or unwell members of society (Snell *et al.* 2015; Liddell *et al.* 2016) and ethnic minority groups (Reames 2016),

[1] The definition of elite is defined further in chapter 3 section 3.4.1.

suggesting attention to those facing injustices. In contrast, by including an elite perspective the research seeks to move past the present application to promote a simultaneous consideration of who is responsible for the inequity and/or its remediation. As far as the author is aware, no other research has explicitly engaged with this question.

In order to fulfill its overarching aim, the research investigates elite perspectives on energy justice at two case studies across the nuclear life cycle, (1) energy production at the Hinkley Point Nuclear Complex in Somerset, and (2) waste reprocessing, storage, and disposal at the Sellafield Nuclear Complex in Cumbria. It samples representatives from the most prominent NGO and policy groups[2] engaged with the research case studies – those for which the facilities in question were a direct concern of their work – in order to address the following overall research question and research questions (RQs):

Overall Research Question: How do elite actors within the nuclear energy system articulate energy justice?

RQ 1: How do the energy justice articulations of elite actors vary through time?

RQ 2: How do the energy justice articulations of elite actors vary according to energy systems component in question?

RQ 3: How do the energy justice articulations of elite actors vary between actors?

These research questions represent areas of growth within the energy justice framework identified throughout as: (1) time, (2) systems component and (3) actor (figure 1.1). The selection of these variables is explained in depth in chapter 2.

[2] The term 'policy' or 'policy organisations' is used throughout for simplicity's sake. This group contains policy as well as industry representatives and academic experts, as discussed in section 3.4.

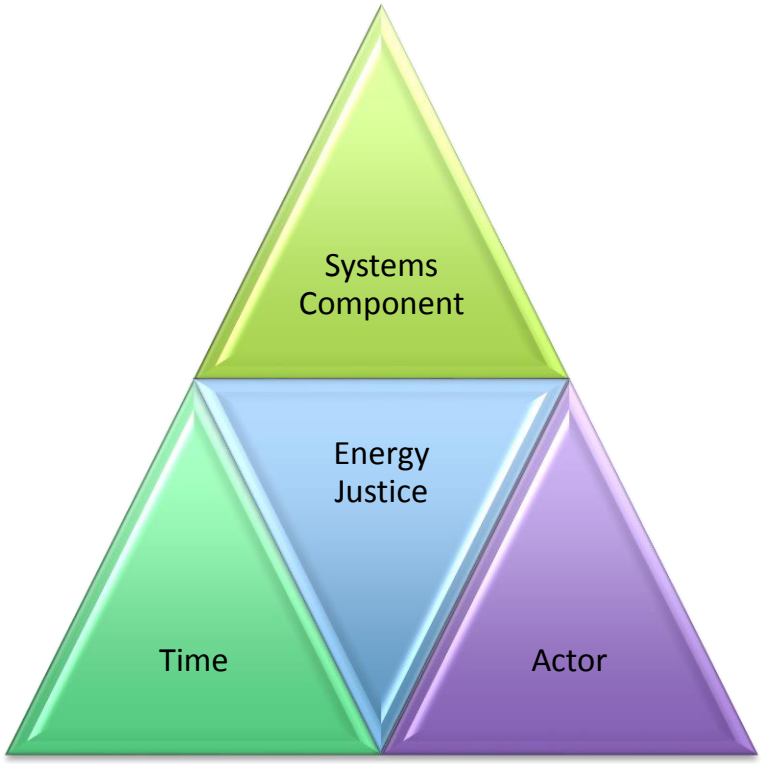

Figure 1.1 The Three Variables of Investigation

1.2 Why Nuclear Energy?

Nuclear energy was chosen for the overall case study for three primary reasons. Firstly, nuclear energy is associated with a well-known set of risks and perceived injustices. For Sovacool (2011) these concerns include the facts that nuclear power is inherently associated with injustice through tragic global events, increased incidents of cancers, dependence on finite uranium resources, toxic pollution of the environment and terrorist threats, amongst others. Sovacool suggests that the occurrence of such injustices means nuclear power is not worth doing, well or otherwise. In examining discourses of justice around nuclear energy this research investigates whether these discourses emerge in popular discourse, and as a consequence if nuclear energy can ever be a morally defensible choice.

Secondly, nuclear energy provides three points of enquiry with regards to the three key variables of investigation of the research outlined above: (1) time, (2) systems component and (3) actor. With regards to the issue of time, nuclear energy is well known for its large, long-term infrastructure and its long lifespan, with a legacy of nuclear waste extending thousands of years into the future, so allowing investigation into temporally evolving energy justice discourses. Nuclear energy also has an international and complex lifecycle implicating eight systems components: uranium mining, uranium milling, conversion, enrichment, fuel fabrication, production, recycling and waste, permitting exploration of the whole-systems approach advocated for in chapter 2. Furthermore, nuclear energy is famed for its divisive nature, with strong pro- and anti-factions and a traditionally hierarchical actor network with classical elites. This enabled investigation into the extent to which these assumed energy justice discourses are different/more nuanced.

Thirdly, nuclear energy in the UK offered a logistically accessible, financially affordable, and timely case study. The UK has over 70 years of nuclear history, from its development of nuclear reactors for the purposes of creating a nuclear deterrent in the 1940s to its contemporary role as a provider of 20.8% of the UK's electricity needs (DECC 2016). Now, the UK has developed a new nuclear programme with proposals for ten new reactors across five sites, with the first reactor initially expected to be in operation in 2018 (Bickerstaff 2008; Heffron 2013) – part of a (somewhat controversial) wider UK industry strategy to deliver around 16 GW of new nuclear by 2030, with proposed facilities at Hinkley Point, Sizewell, Wylfa, Oldbury and Moorside (BIS 2013). This programme sits alongside on-going deliberation over the treatment and storage of UK nuclear waste. The surrounding discourses provided ample opportunity to investigate energy justice articulations, as well as for the later dissemination of the research findings. This study represents one of the first empirical investigations into energy justice as it relates to nuclear energy.

1.3 Chapter Breakdown

To set the context for the research's contribution, the RQs and the methodological approach, chapter 2 presents a review of the academic literature. Overall, the chapter has two aims as it investigates the conceptual and theoretical background of the study. Firstly, it introduces the socio-technical systems literature and the three levels of the MLP – the niche, regime and landscape. It draws attention to the absence of justice considerations within such approaches and contends that it is within the landscape level of the MLP model – the top of the three theoretical levels – that issues of energy justice emerge. Secondly, it introduces, critiques and reconceptualises the theory of energy justice as it stands to date. It draws attention to three areas of growth within the energy justice framework: (1) time, (2) systems component and (3) actor, which inform the methodological approach taken. Chapter 2 concludes that energy justice is neglected in transitions models, and that all three areas of growth are not explicit enough in current energy justice thinking, making a place for them in both present and future research.

Following the review of the academic literature and the identification of emergent research gaps, chapter 3 then sets out the methodological approach taken. It explores the social constructivist epistemology and the research design. It also introduces the case study approach, which is understood to provide context to the results and allow for the exploration of both complementary and contrasting discourses across two UK research areas: (1) energy production at the Hinkley Point Nuclear Complex in Somerset, and (2) waste reprocessing, storage, and disposal at the Sellafield Nuclear Complex in Cumbria. Latterly, it outlines the approach taken to the two main research phases, data collection and data analysis, before reflecting on ethical considerations and the research limitations. The qualitative approach taken throughout is described as consisting of 36 semi-structured oral history interviews with participants identified through a directed snowballing approach. These texts were then analysed using discourse analysis in NVivo.

After an introduction to the background of nuclear energy in the UK and the two case studies in chapter 4, the results are presented in chapters 5 and 6. Chapter 5 explores articulations of energy justice around the first case study, the Hinkley Point Nuclear Power Complex in Somerset, UK. Results are presented according to the three tenets of energy justice, distributional justice, justice as recognition, and procedural justice. Chapter 6 then follows the same format, exploring articulations of energy justice around the second of the case studies, the Sellafield Nuclear Power Complex in Cumbria, UK. Both chapters contribute directly to the overall research question as they explore how elite actors within the nuclear energy system articulate energy justice, as well as the research questions as they consider variations in the energy justice according to the three variables of investigation.

Chapter 7 then consolidates the results from chapters 5 and 6 and draws parallels with the wider literature presented in chapter 2. In so doing it discusses the contribution of the study to knowledge in relation to the study's research questions and the wider literature. Following a case study comparison, it reflects on three key knowledge claims presented as an outcome of the research – those that either contrast with the current literature, advance it, or signal new avenues of future research. It does so according to the three variables of investigation – time, systems component and actor – as it offers the contributions of (1) facility lifecycles, (2) systems approaches, and (3) the question of 'justice by whom?'. In its second half, chapter 7 presents initial interpretations of the implications of the three key energy justice contributions for nuclear energy scholarship, UK nuclear policy, and the wider energy transitions literature. It asks, in effect, why do the theoretical contributions presented through this research matter?

Chapter 8 evaluates the extent to which the research met its aim and answered the overall research question and the three research questions. In closing, and in light of the evidence presented, it offers four suggestions for future research, promoting a legacy of study beyond the lifetime of this PhD.

Chapter 2: Socio-Technical Systems and Energy Justice

Having provided background to the overall aim and structure of this thesis in the introduction, this chapter situates this within the appropriate academic literature as it presents the conceptual and theoretical background of the study. It has two main aims. Firstly, it introduces the MLP model as a mechanism for understanding socio-technical transitions, before articulating the contention that it is within the landscape level of the MLP model – the highest of the three theoretical levels – that issues of energy justice emerge. Secondly, it introduces, critiques and reconceptualises the theory of energy justice as it stands to date, introducing three emergent areas of conceptual growth: (1) time, (2) systems component and (3) actor. It suggests that concepts from ethics and justice provide a structure to think about energy dilemmas, and that all three areas of growth are not explicit enough in current energy justice thinking. Before these sections begin, the following paragraphs provide a more detailed introduction to the structure, and indeed the necessity, of this argument.

Firstly, section 2.1 provides an introduction to the background of the socio-technical systems literature. With sustainability challenges re-working the established patterns of energy supply, distribution and consumption, as outlined in the introduction, new social and technological solutions have emerged, and interest in the concept of socio-technical transitions has grown substantially (Verbong and Geels 2007). Within the abundant literature on socio-technical transitions, four major frameworks have received prominence; transition management (Kern and Smith 2008; Loorbach 2010; Rotmans *et al.* 2001; Kemp *et al.* 2007), strategic niche management (Kemp *et al.* 1998; Raven and Geels 2010; Smith 2007), the multi-level perspective (Geels 2002; Smith *et al.* 2010), and technological innovation systems (Bergek *et al.* 2008; Jacobsson and Johnson 2000; Hekkert *et al.* 2007). Of these, the major framework in Europe has been the MLP, – a model for understanding transitions that is composed of three theoretical levels, the niche, regime and landscape. Given its prominence in

energy research, its favour with the UK government, and its well-established literature foundation, the MLP is the model focused on within this chapter.

Section 2.2 describes each of the three levels of the MLP in turn, whilst considering the role of nuclear energy as an issue of on-going socio-technical change. These sections argue that the 'socio-' or social element is frequently missing from transition approaches as most of us confront energy risks in a moral vacuum (Sovacool *et al.* 2016; Jamieson 2014; Markowitz and Shari 2012; Swilling and Annecke 2012; Newell and Mulvaney 2013; Goldthau and Sovacool 2012). It argues that whilst much of the existing literature on socio-technical systems has been dedicated to understanding niche innovations (Kemp *et al.* 1998; Lopolito *et al.* 2010; Smith and Raven 2012), this has come at the expense of understanding landscape dynamics, the top level of the MLP. Moreover, it contends that it is within the overarching landscape of socio-technical change that issues of energy justice emerge. In so doing, this section begins to make the case for the concept of energy justice as a tool that can aid ethically defensible energy decision-making. Whilst this issue has been problematised (see Butler and Simmons 2013; Eames and Hunt 2013; Fuller and Bulkeley 2013), this research represents the first research to explicitly combine the socio-technical systems and energy justice literatures.

The second half of the chapter introduces, critiques, and reconceptualises the theory of energy justice as it stands to date, assessing if and in what form its core tenets of distributional justice, justice as recognition and procedural justice emerge in practice (McCauley *et al.* 2013). Section 2.4 starts with an exploration of the roots of energy justice in the field of environmental justice. It continues in section 2.5 with a more in-depth exploration of the concept of energy justice to date and an overview of its three core tenets: distributional justice, procedural justice and justice as recognition. In a change from the norm, the core tenets of energy justice are reordered in favour of distribution, justice as recognition, and procedural justice. In so doing, it builds upon Jenkins *et al.* (2016a) who argue for a reordering of the tenets using the logic

that if injustice is to be tackled, you must (a) identify the concern – distribution, (b) identify who it affects – recognition, and only then (c) identify strategies for remediation – procedure, so advocating throughout for a 'what, who, how' framework.

Section 2.6 then critiques the energy justice framework. It does so according to three core variables of investigation – (1) time, (2) systems component and (3) actor – the applications of which are mirrored throughout the results chapters. It concludes that all three points are not explicit enough in current energy justice discourse, and makes a place for them in both this and future research. Finally, section 2.7 advocates for a re-conceptualisation of energy justice that includes a whole-systems perspective at its core, building on the work of publications developed throughout the PhD process (Jenkins *et al.* 2014; Jenkins *et al.* 2016a,b). These contributions identify that one of the core challenges of energy justice is to apply the three-pronged approach across the whole energy system, from resource extraction through to waste. It does so on the understanding that our tendency to break our energy systems into small and understandable pieces can lead to ad-hoc, detrimental policy, as some of our 'solutions' both cause and fail to recognise widespread externalities (Gagnon *et al.* 2002; Meadows 2009; Sovacool *et al.* 2014), including issues of social justice.

2.1 An Introduction to Socio-Technical Systems

The socio-technical transitions literatures were predominantly developed by the 'Dutch school of transition studies' as a mode of governance for sustainable development (Jørgensen 2012; Loorbach and Rotmans 2010; Kern and Smith 2008). Since the first exclusively themed papers in the area in the late 1990s, there has been steady growth in journal publications, conferences, and even topic-specific journals such as Environmental Innovation and Societal Transitions (Farla *et al.* 2012; van den Bergh *et al.* 2011). This growth stems from the desire to understand and stimulate

sustainable, low-carbon innovation, leading to a proliferation of academic studies applying the transition framework. This includes the use of the MLP model to analyse topics including transport and mobility (Whitmarsh *et al.* 2009; Nykvist and Whitmarsh 2008; Whitmarsh and Wietschel 2008), domestic energy (Nye *et al.* 2010), housing (Bergman *et al.* 2008; Smith 2006) and food (Shove 2003). Brief background context to the development of the socio-technical systems theory is provided here before section 2.2 makes the case that it is within the landscape level of the MLP model that issues of energy justice emerge.

Socio-technical regimes originate from a multidisciplinary framework, drawing notably from evolutionary economics, Science and Technology Studies and innovation studies (Geels 2005a). In the early literature, the drivers of transitions were thought to be primarily technology-push with social knock-ons, including changes in the way societal functions such as transportation were fulfilled (Geels 2002; Grubler 2012). The 'technological regime', as initially proposed by Nelson and Winter (1977, 1982), was then advanced by Kemp *et al.* (1998, 2001), and has since expanded most substantially to appreciate social change alongside the technological, leading to the model of 'socio-technical regimes'. The main characteristic that makes these transitions identifiably social in nature is the focus on and inclusion of changes in user practice and institutional structure alongside technological considerations (Markard *et al.* 2012). This comes as recognition that technologies are fundamentally intertwined with user practice, lifestyles, value changes and organisational structures, and that shifts in technology production and use have run parallel with widespread social change, including urbanisation and the growth of the consumer society (Murphy 2015; van den Bergh *et al.* 2011; McLellan *et al.* 2016). As one of innumerate examples, the introduction of automobiles occurred in tandem with changes in road infrastructure, car drivers, oil production and employment through new factories, automobile retailers and repair shops, as well as the increased interconnectedness of the labour force (Schot *et al*. 1994).

A socio-technical transition is seen to lead to a fundamental shift in the whole, interlocking, socio-technical system, including the technology, material, institutional setting, networked supply chains, regulations and belief systems, which, over long time periods, are replaced by new products, services and business models (Smith *et al.* 2010). Socio-technical transitions are seen to be long-term, multi-dimensional, fundamental transformations that, ideally, shift production and consumption to a more sustainable form (Geels and Schot 2010). This change in the socio-technical system partly complements the existing system, and partly substitutes it; take for example, the shift from horse-drawn carriages to automobiles (Papachristos *et al.* 2013; Geels 2005c).

Geels and Schot (2007) identify in the context of energy provision, that whilst no transition is entirely planned or co-ordinated from the outset, contemporary transitions practitioners and theorists focus almost exclusively on the desire to transition towards a decarbonised, sustainable energy system that provides both security of supply and universal access to energy (Bridge *et al.* 2013; IEA 2008; Mernier 2007); a change necessitated as our current energy systems fail contemporary social, economic and environmental criteria (Grubler 2012). Fostering technological innovation is seen to fundamentally underpin these policies for sustainable development, raising the challenge of finding fast-acting, appropriate forms of governance and new, innovative technologies (Nill and Kemp 2009; Coenen *et al.* 2012). This has led to the development of a strong set of literature around the variety of low-carbon technologies, including renewables such as solar and wind (Jacobsson and Johnson 2000; Jacobsson and Bergek 2004; Jacobsson and Lauber 2006), alongside the mapping of historical energy transitions (Geels 2002, 2005b, c, 2006a,b; van den Ende and Kemp 1999). Work by Bridge *et al.* (2013) into historical transitions highlights that major shifts in energy fuel and conversion technologies have underpinned widespread social and geographical change throughout history, including the transition from wood and water power to coal in the 19th century, and then from coal to oil in the 20th. Grubler (2012) adds, in light of such investigations,

that by outlining the drivers and pace of these past transitions we can learn both valuable lessons and cautionary tales, including what is necessary to initiate and sustain the next energy transition towards sustainability.

In addition, much of the early discussion on energy transitions also centred on building future scenarios and the use of visioning techniques, emphasising future energy potential (Elzen *et al.* 2004; Eames and McDowall 2010; Brown 1954, 1956, 1976; Brown and Southworth 2008; Weinberg and Hammond 1972). The analysis of socio-technical transitions, therefore, can be of use in mapping and developing policy for potential future energy change. As such, governments are also increasingly utilising the language of transitions as a model for understanding their own energy transitions, and the concept has begun to feature in the energy policies of countries including Denmark, Switzerland and the UK (Foxon 2013; Lovell 2007; Bolton and Foxon 2015). UK engineers and social and policy analysts have entered the field too, developing a set of 'transition pathways' to a low-carbon, electrified economy. This includes engagement with not only physical infrastructure, but also of many companies performing different roles, including electricity generation, network companies and the National Grid – the UK systems operator responsible for balancing power supply and demand (Hammond *et al.* 2013), effectively highlighting complex human-technology interactions that transitions require (Kern and Smith 2008). The UK government has followed a multi-level perspective to its transition, the format of which is explored in section 2.2.

However, it is increasingly acknowledged that the 'socio-' or social element is frequently missing in the transitions literature and transition plans, including failures to recognise their social justice and equity implications (see Sovacool *et al.* 2016; Jamieson 2014; Markowitz and Shari 2012; Swilling and Annecke 2012; Newell and Mulvaney 2013; Goldthau and Sovacool 2012). As an illustration, the 2011 UK Government's Low Carbon Transition Plan (DECC 2011a) includes only passing reference to justice concepts as it mentions 'fairness', which is characterised as the

fair distribution of costs only without attention to siting issues, procedural justice, or justice as recognition concerns. Eames and Hunt (2013: 58) note that even 'a "low-carbon" transition has the potential to distribute its costs and benefits just as unequally [as historical fossil-based transitions] without governance mindful of distributional justice' or, as is argued throughout here, issues of justice as recognition and procedural justice too. In light of this assertion, this chapter builds the argument that it is within the overarching landscape of socio-technical change that issues of energy justice emerge, where inattention to social justice issues can cause injustices, or via their inclusion can provide a means to solve them.

2.2 The Multi-Level Perspective

The three levels of the MLP – the niche, the regime and the landscape – are introduced in the following paragraphs, which position nuclear energy as an on-going issue of socio-technical change. The core argument is that whilst much of the existing literature on socio-technical systems has been dedicated to understanding niche innovations (Kemp *et al.* 1998; Lopolito *et al.* 2010; Smith and Raven 2012), this has come at the expense of understanding landscape dynamics, the top level of the MLP. Thus, this section focuses in particular on the under-theorised macro-level of the landscape as it contends that this is where issues of energy justice emerge or alternatively, can be solved. As described, the MLP is chosen as the focus for this research due to its prominence in energy research, its favour with the UK government, and its well-established literature foundation.

Rip and Kemp (1998) first developed the MLP in 1998 before it was adopted and theoretically elaborated by a number of authors, including, predominantly, Geels (2002, 2004, 2005a,b,c, 2006a,b, 2010, 2011). The MLP takes the form of a series of nested levels, the niche, regime, and landscape (figure 2.1). According to Geels (2010), these levels refer to heterogeneous configurations of increasing stability. In mobilising geographical metaphors, they aim to provide a contextual account of

technological change and systems innovation over time (Bridge *et al.* 2013; Geels 2002). Geels (2002) stresses that these different levels do not represent ontological descriptions of reality, but instead offer analytical and heuristic concepts to aid the understanding of socio-technical change. They represent, therefore, levels of structural and temporal scale, rather than geographic, administrative or other types of levels (Grin *et al.* 2011). Researchers using MLP focus on how these levels interact to produce both stability and change, often with a particular focus on radical evolution of the system (Whitmarsh 2012).

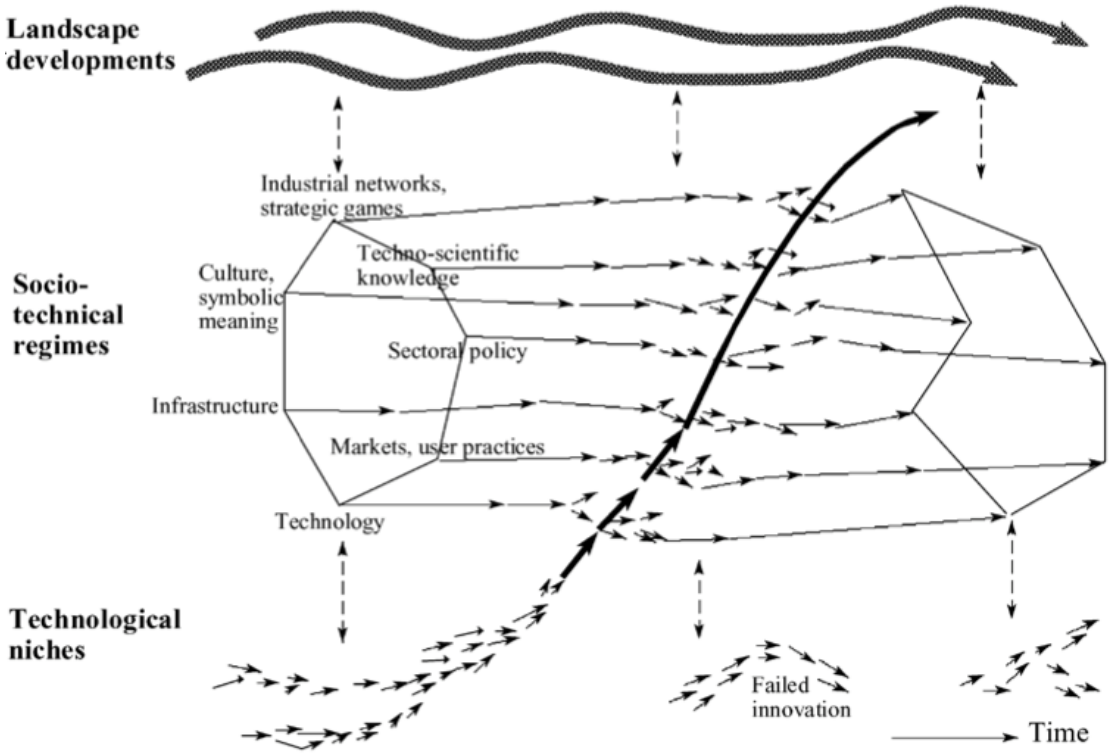

Figure 2.1 A Dynamic Multi-Level Perspective of STS

(Source Geels 2002: 1263)

The specifically nested nature of the levels is introduced in figure 2.2, giving an alternative graphical representation of the MLP. It is the interplay and dynamic between these three levels that creates or constrains technological transitions.

Change occurs when the pressures of multiple levels link up and reinforce each other (Geels 2002), with, according to current interpretations, the main drive for change occurring between the regime and the niche (Geels and Schot 2007). Thus, overall, the MLP examines and simplifies the interactions between niche-innovations and existing regimes, situated within a broader landscape environment. It is only when developments at all three levels coincide that transition occurs (Verbong and Geels 2007).

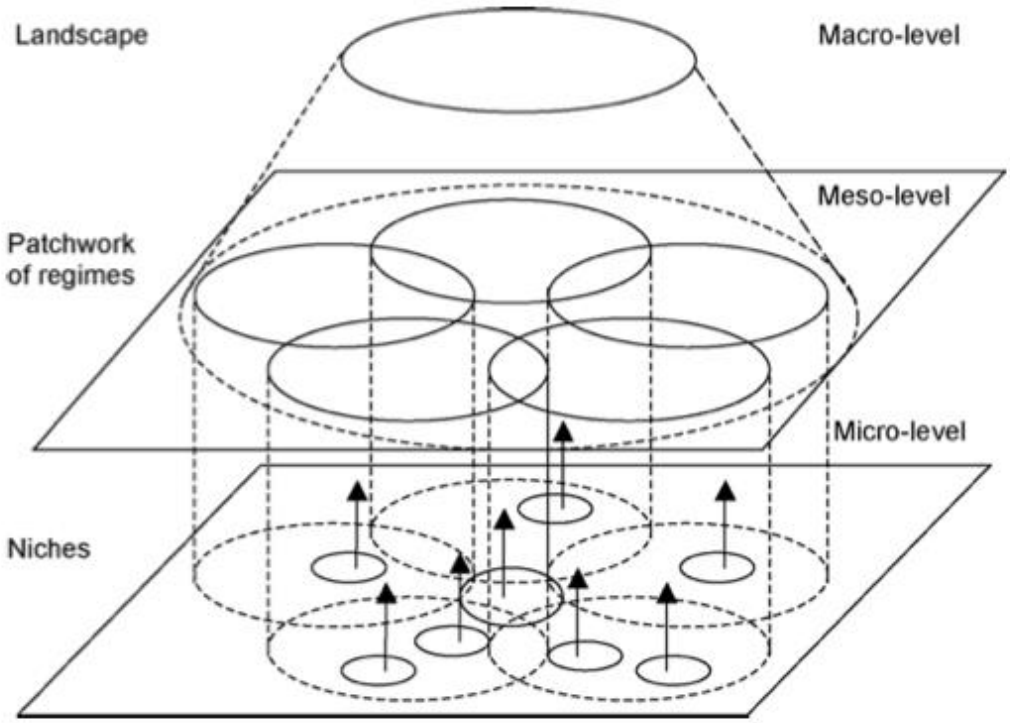

Figure 2.2 Multi-Level Framework for the Analysis of Socio-Technical Transitions (Source Genus and Coles 2008. Originally adapted from Geels 2002)

2.2.1 Niche Level

This section briefly argues that current interpretations of the niche level over-emphasise the role of new innovation at the expense of pre-existing technologies,

including nuclear energy. The niche is characterised as the lowest but most dynamic level, and is typically considered to be the site where radical, revolutionary innovation is developed and generated (Geels 2002; Smith *et al.* 2010). This micro-level 'incubation room' partially shields new technologies from mainstream market selection, allowing the emergence of novelty and social learning (Verbong and Geels 2007; Foxon 2013). In fulfilling this role, niches have been conceptualised as protected spaces, specific markets for example, within which radical innovations can develop without selection pressure from the prevailing regime (Kemp *et al.* 1998). Most transitions literature focuses primarily on the impact and development of 'novel' technologies (Verbong and Geels 2007; Geels 2002) and their potential contribution to future sustainability (Coenen *et al.* 2012). In order to be considered 'transitional' a technology is normally identified as stemming from radical innovation (Genus and Coles 2008). In the energy sector, this has primarily taken the form of renewables – the comparatively recent proliferation of commercial-scale wind energy and biogas, for example (see Juntunen and Hyysalo 2015; Yun and Lee 2015; Olsson and Fallde 2015). Change at this level is less constrained by status quo and business as usual, allowing radical alternatives to societal problems (Whitmarsh 2012). Midttun (2012) notes, however, that development is an uphill battle, where new alternatives have to win favour from policy-makers, regulatory authorities, and investors in the regime in order to secure success.

However, nuclear energy is also positioned as an on-going issue of socio-technical change. Nuclear energy has undergone explicit reframing by the pro-nuclear lobby in the face of the intersecting agendas of climate change, decarbonisation and sustainability, seeing it recast as a potential means of securing both security of supply and climate change stability, and a technology many are reluctantly willing to accept (Pidgeon *et al*. 2008; Poortinga *et al.* 2006). In 2008, for example, the UK government reversed its decision to decommission all nuclear power plants by 2025, announcing instead that new nuclear would play a role in low carbon electricity generation (Doyle 2011). Thus, despite being a comparatively old energy source in

terms of its development in the 1950s, it outlined that it had gained a new 'niche' as a result of climate change pressures. Furthermore, Taebi and van de Poel (2015) outline that alongside the 30 countries that currently produce nuclear energy, another 45 have expressed interest in developing the technology. It seems plausible that nuclear energy production will retain a role in energy mixes, adding to the continued legacy of nuclear wastes and infrastructure already produced. Taebi and van de Poel (2015), Taebi *et al.* (2012) and Landström and Bergmans (2014) outline that the ensuing questions of facility siting, hosting, the possible treatment of nuclear waste, the transfer of waste to the host sites, monitoring and final closure of stations all carry significant socio-technical implications. This is to say that the current and continued utilisation of nuclear power merits its consideration as an issue of socio-technical change, alongside more classically understood 'innovative' technologies, and validates its consideration as the case study of this research.

2.2.2 Socio-Technical Regime

The socio-technical regime, or the meso-level of the MLP, comprises dominant institutions and technologies, and reflects the prevailing set of routines or practices that create and sustain technological systems (Foxon 2013). Due to vested interests and bureaucracy, it is often subject to incremental change (Fuenfschilling and Truffer 2014). It is this level that creates the existing stability of technological development (Geels 2002), and changes slowly and 'normally' under the influence of niche and regime dynamics (Smith *et al.* 2010) – a so-called 'deep structure' that accounts for the stability of the dominant system (Geels 2011). In keeping with this characterisation, socio-technical regimes are often typified with a quality of 'hardness' (Geels 2004). As transitions are defined as changes from one socio-technical regime to another, this level often receives precedence in research (Geels and Schot 2007).

The core concept of the regime is that it imposes logic and direction for socio-technical change along clear pathways of development (Markard *et al.* 2012). According to Loorbach and Rotmans (2010), this meso-level has an unstoppable tendency to self-regulate and operates in command-and-control mode, thus attempting to develop advisory boards and task forces, for example, in order to retain steering and control of the transition process. In most cases, then, the socio-technical regime remains buffered and resistant to change, with a tendency towards path dependence and lock-in (Verbong and Geels 2007). This includes sunk investments, behavioural patterns, vested interests, infrastructure, favourable subsidies and regulations (Geels 2002). Geels (2004) explains as an illustration that once material structures such as nuclear re-processing plants are created they are not easily abandoned, creating a very physical lock-in. Verbong and Geels (2007) later split the elements resisting change into three interlocking dimensions, which for the purpose of this research, can be understood as the nuclear policy arena:

a) Networks of actors and social groups e.g. utilities and large industrial users
b) Formal, normative and cognitive rules that guide the activities of actors e.g. regulations, standards, laws, belief systems and guiding principles
c) Material and technical elements e.g. resources and grid infrastructure

The existence of these three dimensions highlights the co-evolution of social and technical considerations. Within the central, most complex, section of the socio-technical regime illustrated in figure 2.1 above, Geels (2002) identifies seven heuristic dimensions or sub-regimes: technology, user practice and application domains (markets), symbolic meaning of technology, infrastructure, industry structure, sectoral policy and techno-scientific knowledge. A simplified representation of these heuristics is given in figure 2.3. These sub-regimes, according to Geels (2011), are the cause of both additional stability and tensions within the overall regime. Where these tensions exist niche ideas are able to breakthrough and, most importantly, as described in section 2.2.3, landscape pressures exert force. In

earlier work Geels (2002) also states that these different dimensions are both co-evolved, and have their own internal dynamics. It is their interaction, therefore, that gives rise to the tensions represented by shorter, diverging arrows, and regular on-going processes represented by relatively long arrows. These trajectories, Geels (2004) comments, are the outcome of an accumulation of steps moving in a path-dependent direction.

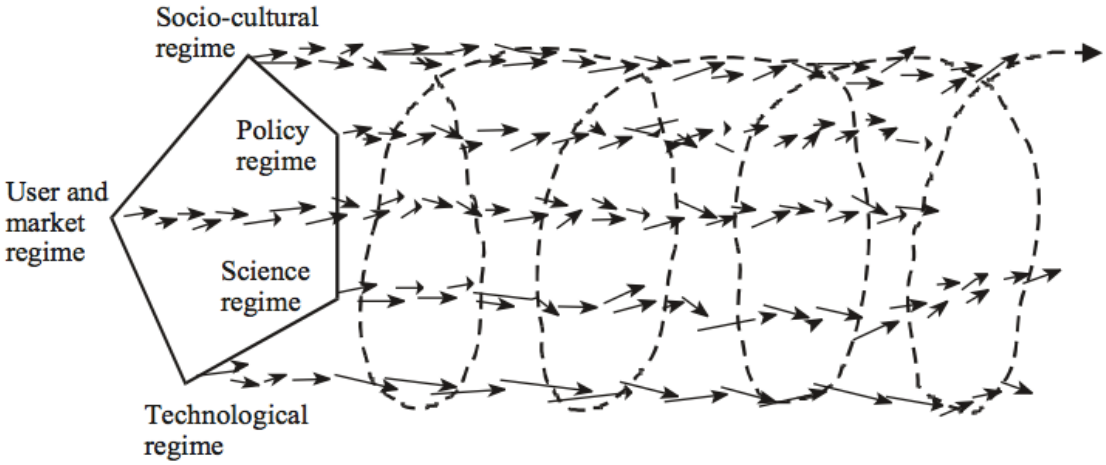

Figure 2.3 Alignment of On-going Processes in a Socio-Technical Regime
(Source: Geels 2004: 912)

2.2.3 Landscape Level

This section presents the argument that it is in the currently under-theorised landscape level of the MLP that issues of energy justice emerge. In placing emphasis in the role of the landscape level, it contributes to a growing body of work that emphasises how the landscape can exert pressure on the incumbent regime below (Hermwille 2016; Morone *et al.* 2015). The third stage of the MLP model, the macro-level landscape, is theorised as containing slow changing external factors (Geels 2002) – broader trends and global events, and the environmental, socio-economic, and cultural context, within which actors and institutions are situated (Lachman

2013; Smith *et al.* 2005). This level is often conceptualised as an environment external to the regime (Coenen *et al.* 2012), thus it represents the broader political, social and cultural values and institutions of society (Foxon 2013); so called quasi-autonomous macro-dynamics (Grin *et al*. 2011). The shape or contours of this landscape make certain socio-technical trajectories more likely than others, and the landscape itself changes only very gradually under the influence of niche and regime dynamics (Verbong and Geels 2007). In this vein, according to Geels (2002) the metaphor of the 'landscape' is chosen to give the literal connotation of the relative 'hardness' and material structure of society, including factories, highways and electrical infrastructure.

Despite their acknowledgement that the landscape contains static or slow changing factors, such as the physical climate and demographic shifts, van Driel and Schot (2005) also attribute the landscape level with a degree of dynamism. This includes, predominantly, rapid external shocks such as war or oil price fluctuations as landscape dynamics. Moreover, Whitmarsh (2012) identifies a number of pressures on this landscape in the form of the environmental challenges of climate change, the economic challenges of oil prices, and the cultural challenge of value and behaviour change. This case can also be made using the example of nuclear energy. Hermwille (2016), Markard *et al.* (2016) and Cotton (2014) demonstrate for example that the rapid external shocks of the Fukushima nuclear disaster had significant impact on the energy sectors in Japan, Switzerland and Germany, with strong effects for the on-going structural change of socio-technical systems.

Despite being relatively slow moving, Geels (2010*:* 495) explains that niches can break through if the landscape level 'creates pressures on the regime that lead to cracks, tensions and windows of opportunity'. Thus, landscape factors can exert pressure on the technological regime, the meso-level, challenging regime stability (Morone *et al.* 2015). It is this relationship that is seen to be most productive for this research. To illustrate such mechanisms, Kuzemko *et al.* (2016) outline that new

scientific knowledge on climate change has placed pressure on the lower two levels of the MLP, fostering widespread change to low-carbon technologies. In this regard, framings at the landscape level can play a role in shaping the energy mix and informing the criteria on which we select technologies, including, quite possibly, with attention to issues of social justice.

Yet despite these examples, the landscape remains somewhat of a 'black box', which is less clearly conceptualised or operationalised than its counterparts (Papachristos and Adamides 2016); a residual 'garbage can' for many forms of contextual influence (Geels 2011). Indeed, it appears to some authors to be the spot for anything that does not readily fit anywhere else, with only environmental concerns sitting unambiguously and comfortably (Whitmarsh 2012; Morone and Lopolito 2015). Lawhon and Murphy (2011: 361) identify to this end that in practice many researchers struggle to do more than provide a coarse description of generic landscape factors. They identify that more studies are required that give insight into either conflicts or complementary landscape factors – including societal norms, values, geopolitics, and economic characteristics, niche innovations, and desired changes in socio-technical regimes. Morone *et al.* (2015) overcome this critique to some degree as they offer a functionally-driven understanding of the landscape level, suggesting that it is an external context for actor interactions where a range of local, national and global stakeholders can create pressure upon the regime level through social, political and economic channels, in keeping with Kuzemko *et al.*'s (2016) climate change argument given above. Therefore, Morone *et al.* (2015) Identify that the landscape level can contain (1) unintentional pressures – the earthquakes and wars introduced above *and* (2) intentional pressures – those deliberately exerted by stakeholders in order to initiate regime change. This includes both local and global actors through grassroots associations, supranational organisations, worldwide economic developments and trends, and political and economic channels (Morone and Lopolito 2015; Harris 2003). Framing energy justice as a matter of priority

alongside the motivations of energy security and environmental protection could lead to reappraisal of our energy choices, and integration of moral criteria.

2.3 Summary of Socio-Technical Contributions

In summary, the above sections have offered three main contributions: (1) they identified, in line with a growing body of authors, that energy decisions are made in a moral vacuum, (2) cast nuclear energy as an on-going issue of socio-technical change and (3) identified that it is within the landscape level of the MLP model that issues of energy justice emerge. Most pertinently, they contended that it is within this overarching landscape of socio-technical change that issues of energy justice emerge, where inattention to social justice issues can cause injustices, or alternatively via their inclusion can provide a means to solve them. They argued in this regard that the bottom two and the top levels of the MLP model directly interact and play a fundamental role in ethically sensitive energy developments. In promoting energy justice as a component of this top level, this represents a case for not only mitigating environmental impacts of energy production via socio-technical change, but doing so in an ethically defensible, socially just way. This chapter now goes on to consider in more detail what 'energy justice' is.

2.4 Environmental and Climate Justice: The Origins of Energy Justice?

Energy justice has theoretical similarities with the field of environmental justice, and carries the same basic philosophy. Environmental justice is commonly defined as the distribution of environmental hazards and access to all natural resources; it includes equal protection from burdens, meaningful involvement in decisions, and fair treatment in access to benefits (see Hofrichter 1993; Hockman and Morris 1998; Low and Gleeson 1998; Schlosberg 1999; Cole and Foster 2000; Bullard and Johnson 2000). The environmental justice movement emerged in 1970s North America as a response to the unequal distribution of environmental ills – pollution and waste

facilities, for example – alongside the risks associated with them, which tended to be inequitably borne by poor coloured Americans (Davies 2006; Williams 1999). Thus the movement represents a concern for the 'fair treatment and meaningful involvement of all people regardless of race, colour, national origin or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies' (Bass 1998: 83), and is driven by aspirations for empowerment, social justice, and public health (McCauley *et al.* 2013). Walker (2012) simplifies this interest into two core issues: (1) how some sections of society consume key environmental resources at the expense of others, and (2) how the power to affect change and influence decision-making is unequally distributed.

Initially, environmental justice complaints focused on local, activism-led, community-oriented means of ensuring the just distribution of toxic burdens; a distributionally-based form of environmental justice inquiry that could be operationalised and measured on a local scale (Holifield *et al.* 2009). Since its inception, however, many authors have noted that the concept of environmental justice has grown both substantively and theoretically (Bevc *et al*. 2007; Buzzelli 2007; Downey 2003; Maantay *et al.* 2007; Mennis and Jordan 2005; Pulido 1996, 2000; Walker 2009; Schlosberg 2013). Williams (1999) illustrates, for example, that federal governments established policies to protect against future inequity in environmental decisions, recognising not just local, but also the national impacts of noxious facilities. Thus the geographical scale of application within the Unites States changed. In this regard, Agyeman and Evans (2004) identify two inter-related dimensions of this form of environmental justice: (1) a local, activist level using it as a vocabulary for mobilisation, action, and political opportunity, and (2) a government level that sees environmental justice as a policy principle, stating that no public action will disproportionately disadvantage any particular social group. Research by Reed and George (2011) demonstrates that despite some overseas proliferation, on the whole environmental justice research remains America-centric.

Alongside this scalar expansion in the application of the environmental justice concept, the topic of concern for the environmental justice movement has grown too, expanding past its original race, activism and toxic industrial-practice roots. In their review of environmental justice literature Reed and George (2011) state, for example, that whilst much research is still framed around the distribution of hazards and risk, the scope of what these risks are perceived to be has grown. Indeed, within the literature topics of concern range from prominent debates on toxic waste, air pollution and landfill sites, to new technology, ecological restoration, transport, health, energy, housing, access to food and forest management, amongst others (Sze and London 2008; Schlosberg 2013; Liu 2000; Walker 2009).

Further, within academic discourse Holifield *et al.* (2009) highlight a shift within the movement towards a more multi-faceted understanding of the concept, where environmental justice is increasingly used in coalition with other theories and agendas, including the capabilities approach, social movement theories, assemblages, and actor network theory. This methodological and theoretical expansion Holifield *et al.* (2009) note has seen environmental justice focus on broader cross-disciplinary debates about knowledge, representation and meaning, opening it to more epistemological and ontological possibilities. In this regard the environmental justice agenda has gradually expanded from a social movement to a policy vocabulary, and a research field in its own right (Bulkeley *et al.* 2013; Agyeman 2014; Walker and Bulkeley 2006).

The broadening scope of environmental justice has also had a notable impact on its core tenets. Indeed, Reed and George (2011) identify a move past the original concern for the spatial distribution of environmental 'goods' and 'bads' to include a consideration of participation and recognition, thus including a social dimension to spatial concerns. This tide change is observable in the literature. Williams and Mawdsley (2006: 661) effectively contrast two case studies: Dobson (1998) who focuses on environmental justice as a primarily distributive concern, and Schlosberg

(2004) who, drawing on Fraser (2001), 'argues that questions of recognition are equally important, with recognition and redistribution both being essential elements of participatory parity which should itself be the basis of justice'. The emergent tenets – distributional justice, procedural justice and justice as recognition – which form the baseline for modern-day conceptions of energy justice, are introduced in section 2.5.1.

The methodological and theoretical growth of environmental justice, as outlined above, sits alongside the evolution of the climate justice concept and movement, which seeks to articulate the connections between climate change and human rights based on normative principles of social justice, democratic accountability and participation and ecological sustainability (Fuller and McCauley 2016). Bulkeley *et al.* (2013: 915) summarise the agenda as the mobilisation of justice with respect to climate policy, and state that the concept has 'provided a means through which to bring concerns for the outcomes and processes of climate policy into the same frame of analysis'. They go on to state that in contrast to the origins of environmental justice in local struggles, climate justice appears predominantly at the international level. Heffron *et al.* (2015) point to the perceived failure of the Kyoto Protocol for example, which triggered climate protests and calls for climate justice. The climate justice framework has, however, more recently been applied to cities, demonstrating both local scale and international applicability (Bulkeley *et al.* 2013).

Yet, despite their widespread uptake within academia, the environmental justice and climate justice agendas are both criticised for their failure to have a pervasive impact. As an illustration, Bickerstaff and Agyeman (2009) note the limited uptake of the environmental justice concept in the UK, where the environmental justice movement does not utilise the vocabulary of mobilising minority and low-income groups, and is yet to make any significant impact on policy and decision-making. Heffron *et al.* (2015: 175) reinforce this assertion by stating that environmental and climate justice face two problems: (1) that their definitions are too broad and (2) that

this has resulted in a difficulty to translate into economics and therefore, policy formation. Thus there is an increasing drive to find new, more focused, models, including those centred on energy issues. In this regard, Sze and London (2008: 1339) term energy issues 'a new front-line in environmental justice research'.

Against this background, and rooted in the growing awareness of the links between energy and social justice, the energy justice concept emerged, incorporating literature from environmental and climate justice as it developed (Hall *et al.* 2013). For Bickerstaff *et al.* (2013: 2), the resultant energy justice concept 'provides a way of "bounding" and separating out energy concerns from the wider range of topics addressed within both environmental and climate justice analysis campaigning'. In this regard there are three distinguishing points about the evolution of energy justice: (1) it borrows heavily from the environmental and climate justice movements, but (2) it is far more targeted in its topic of concern, and therefore has the potential for policy uptake, and (3) unlike environmental and climate justice, it is not the outcome of anti-establishment social movements. The meaning of this latter point, which appears in Heffron *et al*. (2015) and Jenkins *et al.* (2016a), has not been explicitly clear to date. This means that energy justice is, first and foremost, an academic concept, albeit one that has emerged indirectly from decades of activist campaigning. Further, it is not a term that is frequently used in activist discourse. This lack of an anti-establishment past opens the door for significant contributions to mainstream policy-making (Jenkins *et al*. 2016a). In order to outline how energy justice can make such contributions, this chapter now introduces the tenet framework: distributional justice, procedural justice and justice as recognition.

2.5 Energy Justice and the Tenet Framework

Energy justice has emerged amidst the realisation that our energy structures require widespread reform, and out of a growing interest in the justice implications of energy consumption and energy's societal impacts (Hall 2013). Against the

background of the environmental and climate justice literatures, and in light of this surrounding context, energy justice aims 'to provide all individuals, across all areas, with safe, affordable and sustainable energy' (McCauley *et al*. 2013: 1). It does so with a tenet framework informed by the environmental justice movement, including attention to the core tenets of distributional justice, procedural justice and justice as recognition. This section explores the emergence of energy justice, its meaning and its current uptake, and secondly, its three core tenets.

Despite being a relatively new term, the concept of energy justice has gained early prominence as one of eight core themes of the new (2016) Nature Energy journal, as a recently named theme of the UK Energy Research Council (UKERC), as the subject of an upcoming special edition for the journal Energy Policy, and last as the topic of numerous peer-reviewed articles and edited books. Hall (2013) highlights the growing body of work around issues of energy, justice, equity and vulnerability, for example. Indeed, over the three years following the first academic contribution that explicitly reflected upon energy justice from a policy perspective (McCauley *et al.* 2013), peer-reviewed articles and edited books published on energy justice have emerged with regards to whole-systems (Heffron and McCauley 2014; Jenkins *et al.* 2014, 2016a), ethical behaviour (Hall 2013), climate change mitigation (Bickerstaff *et al.* 2013; McCauley *et al.* 2016), household energy consumption (Walker *et al.* 2016), energy policy-making (Heffron *et al.* 2015) and theorisation and methods (Sovacool and Dworkin 2014; Sovacool 2015). Moreover, there have been topic-specific contributions on cities (Bickerstaff *et al*. 2009; Bickerstaff *et al.* 2013), fuel poverty (Walker and Day 2012; McCauley *et al*. 2013; Sovacool 2015; Chard and Walker 2016), the politics of energy infrastructures (Fuller and McCauley 2016; Jenkins 2016) and energy consumption and mobility (Liddell *et al.* 2016; Simcock and Mullen 2016; Walker *et al.* 2016; Chatterton *et al.* 2016; Mullen and Marsden 2016). Such rapid growth merits critical reflection.

Whilst in the early stages energy justice was often used in tandem with the concept of fuel poverty (Snell *et al.* 2015; Sovacool 2015; Reames 2016; Chard and Walker 2016; Teller-Elsberg *et al.* 2016; Walker and Day 2012; Middlemiss and Gillard 2015), as energy rises up the political and academic agenda this is just one way in which power relations, fairness, and disadvantage are created and expressed (Hall *et al.* 2013). Thus, the energy justice tenets are increasingly utilised in the global context of energy production *and* consumption, including with attention to the issues of energy policy, energy production and systems, energy consumption, energy activism, energy security, the political economy of energy, climate change and many more (Jenkins *et al.* 2016a).

Further, energy justice is increasingly characterised as an analytical tool; one that, for Heffron *et al.* (2015), can achieve a just balance between the three dimensions of the energy trilemma. As one example, Heffron *et al.* (2015: 172) develop an energy justice metric, which is designed to connect with economists through quantitative analysis of energy justice, allowing it to be evaluated in monetary terms. This approach produces three results: (1) an individual-country energy justice metric and (2) an energy justice metric for each type of energy e.g. nuclear power, both of which allow (3) the cost of energy justice to then be factored in to an economic model calculation in the form of a cost-benefit analysis. Sovacool and Dworkin (2015: 436) state in relation to such models, that energy justice thus 'presents a useful decision-making tool that can assist energy planners and consumers in making more informed energy choices' as well as serving as 'an important analytical tool for energy researchers striving to understand how values get built into energy systems or to resolve common energy problems'. In this regard the energy justice concept is increasingly seeking to move past academic discourse to non-academic applicability, including engagement with lawyers, economists and policy-makers (Heffron *et al.* 2015; Sovacool and Dworkin 2015; Sovacool *et al.* 2014; Jenkins *et al.* 2016a), a concept explored further in section 2.7 as this research makes a case for its own

model based on whole-systems thinking. Firstly, however, each of its core tenets is introduced in turn.

2.5.1 The Tenet Framework

Within the field of environmental justice, and latterly energy justice, a range of tenet frameworks have emerged. McCauley *et al.* (2013) use three core tenets, distributional justice, procedural justice and justice as recognition, whereas others dismiss the inclusion of recognition as a tenet, including Sidortsov and Sovacool (2015) who instead focus on distributional justice, procedural justice and cosmopolitanism as core concepts. In keeping with McCauley *et al.* (2013), however, this research utilises the framework of three core tenets, distributional justice, procedural justice and justice as recognition, including justice as recognition as the third tenet based on the works of Fraser (2014). Thus it borrows in part from Fuller and Bulkeley (2013), who focus on the application of distributional and procedural justice considerations in energy justice based on the work of Rawls (1991).

In a change from the norm, however, the order in which they are typically used is altered – distribution, procedure, recognition –, and instead justice as recognition is placed in second place – distributional justice, justice as recognition, and procedural justice. This approach builds upon the work of Jenkins *et al.* (2016a) who argue for a reordering of the tenets on the logic that if injustice is to be tackled, you must (a) identify the concern – distribution, (b) identify who it affects – recognition, and only then (c) identify strategies for remediation – procedure. This framework adopts a 'what, who and how' approach to tackling energy justice concerns, with the intention that energy justice can exist as a solution-based framework that not only characterises injustices but can also help tackle them, thus taking on both evaluative and normative roles. Each of these tenets is now introduced in turn.

2.5.1.1 Distributional Justice

The first tenet of energy justice is distributional justice, which manifests at both the stage of energy production and that of energy consumption. Energy justice is an inherently spatial concept that includes both the physically unequal allocation of environmental benefits and ills and the uneven distribution of their associated responsibilities (Walker 2009: 615): for example, exposure to risk. Thus, energy justice can appear as a situation where 'questions about the desirability of technologies in principle become entangled with issues that relate to specific localities' (Owens and Driffill 2008: 4414), and represents a call for the distribution of benefits and ills on all members of society regardless of income, race etc. (Bullard 2005).

The concept of distributional justice has a strong foundation in the environmental justice movement. Bowen (2002: 3), comments in his review of early environmental justice literature, that 'literally dozens of published articles on environmental justice begin by stating that a large body of empirical research demonstrates that minorities, low income, and otherwise disadvantaged and susceptible neighbourhoods are disproportionately exposed to environmental hazards'. Thus, past research focused on the physical siting of infrastructures, and the locational effects of environmental risk (Mitchell and Norman 2012). In this respect, since its earliest emergence as a civil rights concern environmental justice, and distributional justice within it, has been intensely geographical (Walker and Bulkeley 2006).

More recently, Fuller and McCauley (2016) illustrate that distributional concerns appear on both sides of the energy production/consumption dualism. Production-oriented questions of distributional justice often appear in relation to the siting of pre-existing energy facilities, and the development of new energy infrastructures (Fuller and McCauley 2016). Research has shown unequal placement of nuclear facilities in areas of low-income, for example (Sze and London 2008). Further, the

highly contentious matter of wind farm siting in Scotland illustrates concern over the placement of new build infrastructures (Warren *et al.* 2005) as, in the case of the UK, research demonstrates that it is often the deprived and least powerful social groups that are disproportionately impacted (Todd and Zografos 2005; Fast 2013). In consumption terms, distributional justice is typically discussed as access to affordable energy, as exemplified by the ready application of energy justice literature to the issue of fuel poverty (Fuller and McCauley 2016; Walker and Day 2012; McCauley *et al*. 2013; Sovacool 2015). In this vein, Sovacool and Dworkin (2015) highlight the consideration of distributional justice as issues of availability, affordability and sustainability.

With this production and consumption dualism in mind, McCauley *et al.* (2013: 1) argue that energy policy needs to address the unequal distribution of ills across the energy system, including with attention to infrastructure siting, subsidies, pricing (e.g. fuel poverty) and consumption indicators (e.g. smart meters), to name but a few. This idea is developed this further in section 2.7 with the advancement of a whole-systems approach to energy justice.

Distributional justice does recognise that some resources are naturally and unavoidably unevenly distributed – the distribution of fossil fuel resources or the suitability of sites for wind energy, for example. Thus, Walker and Bulkeley (2006) and Eames and Hunt (2013) note that unequal distribution is not always unjust. Instead, it is often the 'fairness' of the processes surrounding infrastructural development that is important (Walker and Bulkeley 2006: 4), and as such claims for distributional justice require that evidence of inequality are combined with an argument for fair treatment (Eames and Hunt 2013). Throughout this thesis such arguments are taken to manifest as calls for justice as recognition and procedural justice.

2.5.1.2 Justice as Recognition

The inclusion of justice as recognition as a core tenet of energy justice is widely debated. For some the focus is primarily on matters of distribution (Vincent 1998; Dobson 1998), whereas for others justice as recognition is acknowledged, but only as a tacitly included element in the ideal definition of distribution and/or participation (Schlosberg 2004). Fraser (1999: 98) highlights further that some perceive it to be a 'false consciousness', and a hindrance to the pursuit of social justice. However, following both Fraser (2001, 2009) and Young (2011), recognition is now treated as a distinct tenet. Indeed, in line with the 'what, who, and how' tenet framework used throughout this thesis, justice as recognition is taken to be a means of explicitly engaging with the questions of 'who' is energy justice for, *and,* as outlined in section 2.6.3, who is responsible for its provision.

Justice as recognition appears as a concern for 'how people are involved in environmental decision-making, or "who (and what) is given respect"' (Eames 2011). Drawing on Fraser (1999), Schlosberg (2007: 18) conceptualises the concerns around justice as recognition as three separate issues: (1) practices of cultural domination, (2) patterns of non-recognition (invisibility of people and their concerns), and (3) disrespect through stereotyping and disparaging language: misrecognition. Within this context justice as recognition is more than tolerance, and requires that individuals must be fairly represented, that they must be free from physical threats, and that they must be offered complete and equal political rights (Schlosberg 2003). Each of these three points in now described in turn.

The process of cultural domination may include, as one of innumerate potential examples, 'the process of disrespect, insult and degradation that devalue some people and some places' identities in comparison to others' (Walker 2009: 615). In this context justice as recognition calls for the respect of difference, and a move to prevent one group dominating another (Martin *et al*. 2013). Further, justice

recognition also represents a call to acknowledge diversity within and between environmental justice movements (Hall *et al*. 2013). Thus it includes calls to recognise the divergent perspectives of different ethnic, racial and gender differences (Fraser 1999).

As outlined above, justice as recognition also appears as non-recognition, the invisibility of people and their concerns, as exemplified by the often-cited issue of fuel poverty. Sovacool (2015), in his exploration of affordable warmth and justice, highlights concern for a particular group in society – those unable to access affordable heat. Sovacool (2015: 363) states that fuel poverty 'can be read as a lack of recognition of the needs to certain groups, and, more fundamentally, as a lack of equal respect accorded to their wellbeing'. In the UK, Heffron *et al.* (2015) report that this has led In the UK to targeted policies that recognise the specific needs of particular social groups, including winter fuel payments for elderly and infirm members of society who rely on higher than average room temperatures. Thus, justice as recognition also emerges as a call to recognise differential needs and forgotten social groups.

Finally, concerns may also arise not over a failure to recognise, but as misrecognising, a distortion of people's views that may appear demeaning or contemptible (Schlosberg 2003). As one example of justice as recognition as a process of disrespect, McCauley *et al.* (2013) highlight the potential for organised misrecognition in the case of UK energy siting. They state for example that many regulators in the renewable power industry, and environmental NGOs, often deride local campaigns against wind farms as 'not-in-my-backyard' protests by self-interested and misinformed individuals. This lack of recognition, it is claimed, can go on to damage the reputation of communities in the larger cultural and political realm. Thus misrecognition may not only harm and constrain individuals, but can serve as the foundation for distributional injustice (Schlosberg 2004).

2.5.1.3 Procedural Justice

The last tenet in the reordered energy justice tenet framework is procedural justice, or the 'how' of energy justice. Procedural justice concerns access to decision-making processes that govern the distributions outlined above, and manifests as a call for equitable procedures that engage all stakeholders in a non-discriminatory way (Walker 2009; Bullard 2005). It states that all groups should be able to participate in decision-making, and that their contributions should be taken seriously throughout. It also requires participation, impartiality and full information disclosure by government and industry (Davies 2006), and the use of appropriate and sympathetic engagement mechanisms (Todd and Zografos 2005). It is concerned, then, about the fairness of decision-making processes, or justice in 'doing', and emerges as a claim for representational space and free speech (Sayer 2011; Sze and London 2008). For Walker (2012) these requirements can be split in to four key rights:

(1) Access to information
(2) Access to and meaningful participation in decision-making
(3) Lack of bias on the part of decision-makers
(4) Access to legal processes for achieving redress

Claims for procedural justice initially became synonymous with politically excluded civil rights movements across North America (Gibson-Wood and Wakefield 2013), and have thereafter been applied to class (Taylor 2000), gender (Buckingham and Kulcur 2009) and religion (Schlosberg and Carruthers 2010). Procedural justice is underpinned by access to and pressure from multi-level legal systems (Walker and Day 2012) and is simultaneously driven by softer non-regulatory influences such as practices, norms, values and behaviours (Hall 2013).

Procedural justice manifestations include, as an illustration, questions arising around how and for whom community renewables projects are developed (Walker and

Devine-Wright 2008), and the ethics of the emergent voluntarism debate, where communities volunteer to host facilities (Butler and Simmons 2013). In addition, Fuller and McCauley (2016) identify that procedural justice debates are increasingly becoming more prominent across the energy production/consumption dualism as outlined above, with, for example case studies around the siting of turbines versus the access of some groups to affordable warmth. Sovacool (2015) notes by way of illustration that the issue of fuel poverty intersects with procedural justice, as affected households have neither the time nor the means to participate in energy policy decision-making.

To illustrate the broad applicability of the procedural concept Jenkins *et al.* (2016b) utilise the example of energy subsidies to illustrate the emergence of concerns that are subject to the issue of full information disclosure. They question, in particular, whether the public are in full knowledge of what subsidies different energy sources in the energy sector receive. Despite research in the UK into the energy subsidies each energy type receives and how this could inform the public's choice as to the components of the future energy mix, there was not a conclusive outcome. Thus, Jenkins *et al.* (2016b) argue that there remains a lack of core procedural justice elements of participation, impartiality and full information disclosure by government and industry on the issue of energy subsidies, leading to potential artificial skews in public perceptions to one form of energy or another. Such information disclosure should be readily accessible so that all stakeholders can construct informed decision-making as to what energy sources we should have. This is especially relevant given the notable effect of subsidy costs on societal welfare, as is discussed in Farrell and Lyons' (2015) exploration of renewables subsidies in Ireland. Davies (2006: 709) cautions, however, that 'while participatory mechanisms may appear to be equitable, they are inevitably set within broader social and political systems that can perpetuate established inequalities'. This includes the failure to recognise marginalised social groups: justice as recognition.

This statement highlights the inevitable overlap of the three tenets outlined above. According to Walker and Day (2012), the three tenets listed above are informed by a body of academic work that is directly interested with how justice is made sense of in everyday contexts. In reality, as with many academic concepts, the boundaries between the tenets often become less distinct (Jenkins *et al.* 2016b). According to McCauley *et al.* (2013: 1) they are frequently seen as interlinked, and are perceived to share many overlapping issues. So too, this chapter contends, do many energy issues when seen through a systems lens. It is in this statement that this research finds its niche, as this chapter makes the case for a whole-systems approach to the energy justice literature. To build the case, this chapter first considers current theoretical discussions around the issues of temporality, geographical scale and the roles of actors within the justice literature.

2.6 Refining the Energy Justice Framework

Based on the review of the literature above, three areas of conceptual growth in the energy justice literature appear – time, systems component and actor – the application of which is mirrored throughout the results chapters (figure 2.4). This section discusses firstly, the issue of temporality within the energy justice framework, including consideration of whether energy injustices change through time and whether the framework should remediate past and present injustices, act as a framework for considering future injustices, or do all of these. Secondly, it calls into question the spatial applicability of the energy justice concept, discussing the contexts of its current use and considering whether it is able to translate across scalar scales: local, national, international and global energy justice manifestations. Finally, this section explores the actor of concern for energy justice, before making the case that we should not only be concerned with the victims, but in order to make a just transition we should also be concerned with those that are responsible for energy-based decision-making. It concludes that all three points are not explicit

enough in current energy justice discourse, and makes a place for them in both this and future research.

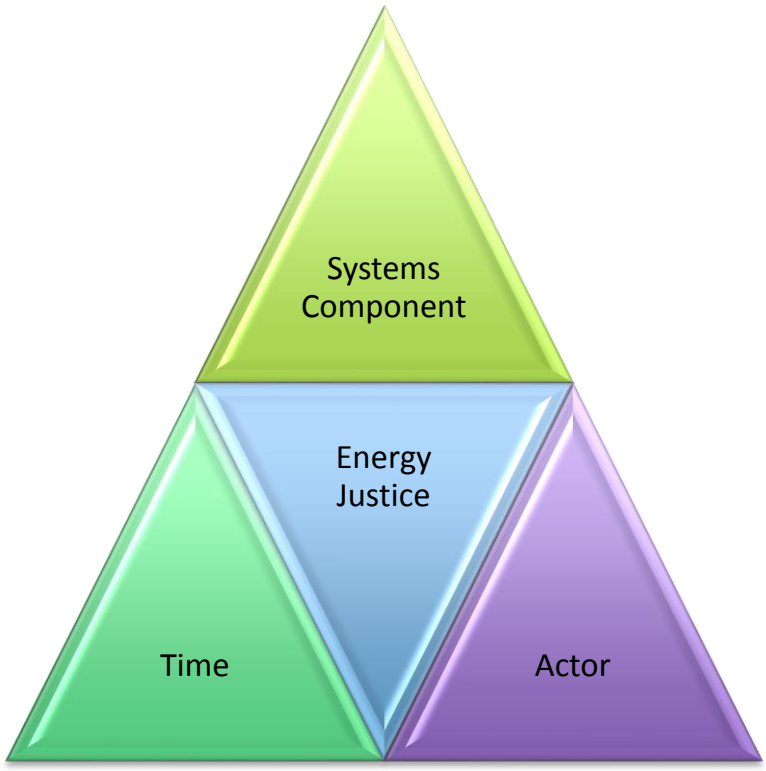

Figure 2.4 The Three Variables of Investigation

2.6.1 Reflecting on Temporality

In line with Bickerstaff *et al.* (2013), Fuller and McCauley (2016: 8) identify that 'the question of time may be significant in further understanding the impacts of energy justice activism for the future'. For the purposes of this research, however, the importance of temporality within the energy justice framework is taken far beyond the realms of activism. Indeed, in developing a temporal approach to the three-pronged 'what, who, how' framework outlined above, this work exemplifies the range of temporal explorations required at all stages of an energy infrastructure and across all actors.

Heffron *et al*. (2015: 169) comment that 'energy justice is an inherently spatial, *temporal* and social concept'. However, its treatment within current research is confusing as, where it does appear, it does so in strongly contrasting ways. Sidortsov and Sovacool (2015: 306) state, for example, that 'energy justice is best understood by examining instances of injustice' and that 'it is unlikely that one would take note of how just and fair things are unless something disturbs the status quo'. In this regard they highlight a tendency to look back in time, take an evaluative approach, and consequently focus on the remediation of past injustice. In a separate piece, however, Sovacool (2013a: 959) observes that energy justice raises the issue of fairness for 'future generations, as we will leave them with the legacy of polluted atmosphere and a potentially unstable climate'. In keeping with this statement, Heffron *et al.* (2015: 171) introduce the concept of thinking in the 'future tense', whereby specific attention is given to future generations, and to ensuring that they are treated as equally significant to the present populations. Thus they focus on mitigation of potential injustices in the future. In line with Jenkins *et al.* (2016a), this chapter highlights that this temporal division highlights both the evaluative and normative reach of energy justice, where practitioners can both assess injustices and also make recommendations on how they should be approached.

Temporal issues are, however, more complex than that. As one example, the literature frequently fails to consider how justice manifestations can change through the lifespan of one energy site, for example at the stage of construction of a nuclear power plant as opposed to its decommissioning. As one further example, Heffron *et al.'s* (2015: 169) study on the utility of the energy justice concept for solving energy trilemmas argues that energy justice is specifically intertwined with the development of new energy infrastructure, and 'that this is where the value and effectiveness of energy justice can be delivered in policy application'. In this regard they fail to address the potential to remediate past injustices at pre-existing sites, and as a consequence the potential for energy justice to inform procedures throughout the various stages of a site's lifespan, including at the stages of development, operation,

and decommissioning. Indeed, by utilising the 'what, who, how' framework outlined above, it is possible to see that this is just one instance in which temporal reflexivity within the energy justice framework becomes significant (table 2.1). This idea of temporal reflexivity is developed throughout the results chapters as they consider past, present, and future manifestations of energy justice both across space, and at any one given facility.

Tenet	Temporal Question	Example of Shifting Concern
What (distributional justice)	Which stage of the operative facility's lifespan is of concern: siting, operation or decommissioning?	**Siting:** the potential for local landscape transformation
		Decommissioning: the loss of jobs and amenities
Who (justice as recognition)	Are you concerned with past, present or future generations?	**Past:** Communities seeking remediation and compensation
		Present: Communities seeking consultation
How (procedural justice)	At what stage in the development of a facility are you?	**Planning:** Planning consultations
		Operation: On-going Site Stakeholder Groups

Table 2.1 Temporal Examples of the 'What, Who, How' Framework of Energy Justice

2.6.2 Reflecting on Systems

This section argues that environmental justice, and resultantly the embryonic concept of energy justice, lack scalar focus. Bickerstaff and Agyeman (2009: 783) comment in line with this that early iterations of the environmental justice literature are characterised by formal, literal, representations of scale, but that such iterations

appear unable to cope with 'multiplicity, change, and, by implication, the socially and politically constructed nature of scale', adding that there remains a high level of spatial ambiguity in environmental justice research. To this end, Kurtz (2003: 888) highlights that 'the problem of environmental inequity is thus characterised by spatial ambiguity and, with no indisputable rationale for favouring one scale of resolution and analysis over another, environmental justice politics are permeated by considerable debate over the nature and spatial extent of both problem and possible solutions'. In observing the early applications of energy justice, this also appears to be the case for this emergent literature. Energy justice has to date been applied at a range of spatial scales, including work on the local scale via cities (Bickerstaff *et al*. 2009; Bickerstaff *et al.* 2013), national fuel poverty issues (Snell *et al.* 2015), calls to apply energy justice to the Arctic region (Sidortsov and Sovacool 2015) and explorations of the concept's global applicability (Jenkins *et al.* 2016a). Alongside these are cross-scalar enterprises, including applying energy justice to energy supply chains (Heffron and McCauley 2014). There seems, therefore, relative lack of scalar focus for its applicability.

As a response to such criticisms many authors (Heynen 2003; Heynen *et al.* 2006; Perkins *et al.* 2004; Trainor *et al.* 2007; Wolch 2007) argue for a multi-scalar focus and interconnected approach; an acknowledgement, according to Holifield *et al.* (2009: 4), that 'place-specific policies and practices can have consequences that cross national boundaries, affect multiple scales, and extend across global networks'. The need for this is clear. Butler and Simmons (2013) draw attention to the fact that individuals that are considerable distances away from the negative impacts of uranium mining often garner the benefits of nuclear power. Further, Heffron *et al.* (2015) stress that globalisation has caused linkages that cross national borders and create solidarities between different communities, highlighting that the resulting issues, including atmospheric pollution, cannot be solved by one group alone. They go on to add that due process is relevant to every level of decision-making at local, provincial, national and global scales. Thus they promote the application of

cosmopolitanism to energy justice frameworks, a consideration of the idea that we are all global citizens. Within this they argue for a collective approach to resources, including a targeted focus 'on energy resources, in an attempt to achieve a meaningful global change specifically in energy behaviours and attitudes' (Heffron *et al.* 2015: 170). Whilst this concept is generally agreeable, it also appears highly problematic: who takes responsibility? How do we deal with past injustices? Whose rights do we promote? With such issues in mind, the energy justice framework requires a means of uniting these currently disparate scales of applicability and, as a result, of recognising the different actors they implicate (section 2.6.3). This claim builds upon the work of Fuller and McCauley (2016: 7) who state that 'one opportunity for an energy justice frame is the ability to overlay specific normative claims of justice with questions about energy in a whole-systems approach, often a limitation of existing discourses of environmental justice'.

2.6.3 Reflecting on Actors

The third and final factor which that needs more investigation is that of actors, or the 'who' of energy justice. This is necessary on two counts, both in questioning 'justice for whom?', and as a reflection on 'justice *by* whom?'. These questions move past the original application of energy justice, which focuses almost exclusively on those facing injustices, to promote a simultaneous consideration of who is responsible for the inequity and/or its remediation. In so doing it develops the work of Heffron *et al.* (2015), who identify that the purpose of energy justice is to (1) identify when and where injustices occur, and (2) to identify how best academics and practitioners can critically evaluate the impacts of energy policies, and how best they can respond – thus attributing accountability.

Answers to the question, 'who is energy justice for?' have so far received a range of different answers: the elderly and infirm as those that suffer most from fuel poverty (Fuller and McCauley 2016; Walker and Day 2012; McCauley *et al*. 2013; Sovacool

2015), poor and ethnic communities who historically shouldered the burden of toxic waste dumps (Williams 1999; Davies 2006) or anti-wind campaigners whose opinions are often derided (Jenkins *et al*. 2016a), as three of innumerate potential examples. In this circumstance, the answer appears to be pluralist. Evidence from the environmental justice movement, however, suggests that we should further consider who is being ignored, and who we are not recognising. Environmental justice research frequently considers the burden of racial minorities, and more recently indigenous communities, but neglects other sections of society. As one illustration, Reed and George (2011) state that not enough attention is paid to the role of gender in justice disputes. Environmental justice is also frequently criticised for regarding communities as coherent, homogenous and united groups of people, whereas in fact residents are frequently far from that (Fan 2006a). Assuming this kind of collective advocacy, according to Bickerstaff and Agyeman (2009), neglects the potential for it to be parochial or inequitable at another scale. In the same vein, Heynen (2003: 993) points out that 'little attention has been given … to understanding how socio-natural injustices at particular scales do not necessarily translate into injustices at other scales'. This section makes the case for a whole-systems approach to energy justice as a means of capturing the justice discourses of all actors across the relevant scales.

Further, there needs to be a focus not only on 'justice for whom?', but 'justice *by* whom?'. Sovacool *et al.* (2016: 1) offer one approach when they state 'an important dimension to justice goes beyond concepts and analysis to decisions and thus decision-making, including policy-makers and regulators as well as ordinary students, jurists, homeowners, businesspersons, investors, and consumers'. In this regard, they highlight that we *all* bear the burden of creating energy justice, even when we make the most mundane energy choices such as turning on a light switch. Further, Heffron and McCauley (2014: 437) add that 'justice is concerned with social responsibility by the private sector, the government and the public. The choices that they make will have a significant impact upon both global climate change, and in particular, inter-generational justice'. Both statements, however, do not engage with the power

differentials in each group, their awareness of the issue, or their range of capabilities. These statements are too broad, and they permit the diffusion of responsibility. Instead, if the purpose of energy justice is to serve as an analytical tool and move past academic discourse, it must narrow its focus. Heffron *et al.* (2015) go some way towards this in designing an energy justice metric designed specifically with economists in mind. In taking an elite perspective and engaging with policy, industry and NGO groups, this research seeks to go further towards answering this question, identifying potentially new audiences that are capable of directly tackling the prevalence of energy injustices.

2.7 Reconceptualising Energy Justice: A Whole-Systems Approach

In promoting the increasingly recognised concept of energy justice and proposing a reconceptualisation of current theory that includes a whole energy systems perspective, this section builds on the work of publications developed throughout the PhD process (Jenkins *et al.* 2014; Jenkins *et al.* 2016a,b). These contributions identify that one of the core challenges of energy justice is to apply this three-pronged approach across the whole energy system from the stages of resource extraction right through to waste. Thus, this research is situated within an emerging body of literature seeking to embed questions of justice and equity within energy systems (Fuller and McCauley 2016; Bickerstaff *et al.* 2013; McLaren *et al.* 2013; Adams *et al*. 2012; Sovacool 2013; Sovacool and Dworkin 2014; Sovacool and Dworkin 2015). Further, it fulfils a research gap outlined by Fuller and McCauley (2016: 7), who state that 'understanding and tracing the potential interconnections between production and consumption alongside distribution and procedure is fundamental to developing and articulating an energy justice frame'. This approach draws in particular on the issue of spatiality outlined above as it considers the geographical reach of the energy justice concept. Further, in looking across the energy system from mining to waste, this model seeks to capture the justice

discourses of all actors across the relevant scales, revealing groups that are often excluded from decision-making.

The need for a whole-systems approach stems from both perceived and realised failures in energy systems governance (Gagnon *et al.* 2002). Meadows (2009) highlights the tendency to break our systems into small and understandable pieces. Yet such an ad-hoc, often national-scale policy approach can be detrimental, as for example some of our 'solutions' both cause and fail to recognise widespread externalities, including climate change and resource depletion (Gagnon *et al.* 2002; Meadows 2009; Sovacool *et al.* 2014). By way of illustration, Florini and Sovacool (2009) draw attention to gaps in the international system's ability to manage energy's externalities and so secure a transition to low-carbon sources, externalities that this research argues include questions of social justice.

Our current approach, where we focus on production and consumption as distinct outcomes of energy provision, means that typically our supply is governed through piecemeal, ad-hoc responses (Florini and Sovacool 2009). Whilst the UK's 2008 White Paper 'Meeting the Energy Challenge: A White Paper on Nuclear Power' mentions uranium mining in terms of security of supply and environmental damage, for example, it does not mention social implications of the process, including the health impacts on workers and recognition of indigenous peoples and treaty rights (BERR 2008). To this end, Newell and Mulvaney (2013: 138) discuss the frequent presentation of nuclear power as 'clean' energy without acknowledgement of its social context, including the environmental injustices associated with uranium/yellow cake mining, and long-term nuclear waste storage problems. They warn of the burdens of nuclear power being unevenly distributed internationally, 'particularly if "clean energy" is pursued without attention to energy justice'.

With such dilemmas in mind many authors (Heynen 2003; Heynen *et al.* 2006; Perkins *et al.* 2004; Trainor *et al.* 2007; Wolch 2007) argue for a multi-scalar focus; an

acknowledgement, according to Holifield *et al.* (2009: 4) that 'place-specific policies and practices can have consequences that cross national boundaries, affect multiple scales, and extend across global networks'. In this vein Newell and Mulvaney (2013: 138) comment too that the 'social and spatial dimensions of energy and climate justice force us to consider the scope for stronger forms of energy governance beyond the state that are able to address these complex relationships'. Such an approach, according to Newell and Mulvaney (2013: 133) 'reiterates the importance of comprehending the global dimensions of the issue in the everyday, increasingly transnational, organisation of production and consumption through global supply chains, rather than through the dramatic, site-specific and more visible instances of environmental justice conflicts and mobilisations which feature in much of the literature'.

As illustrated above, new perspectives and research are needed to understand the complex relationship between the global transformation of social and natural systems (Biermann 2012; Biermann and Gupta 2011; Dryzek and Stevenson 2011). This chapter proposes a whole-systems approach to energy justice as a tool. It advocates for a combination of the social science account of energy (policy) with its natural science counterpart (systems). This approach provides a more nuanced understanding of justice concerns through the exploration of distributional, recognition-based and procedural justice issues within the context of both energy production *and* consumption, questioning firstly where, across a global energy system, the injustices lie (Heffron and McCauley 2014: 435).

A whole-systems approach involves identifying the characteristics of the system in question – its elements, interconnections and overall function – and examining the interactions between them (Meadows 2009). The energy system is defined as the entire energy chain, from mining, conversion, production, transmission, and distribution, right through to energy consumption and waste, and exists to fulfil the goal of energy production from a variety of sources (Bevier 2009; Alanne and Saari

2006; Gagnon *et al.* 2002). Such systems are taken as both material in terms of their physical infrastructures and also social in nature, as recognition that technologies are intertwined with user practice, life styles, value changes and organisations (Markard *et al.* 2012; Kern and Smith 2008). In line with Goldthau and Sovacool (2012: 233) then, 'energy' is referred to as a socio-technical system that includes traditionally overlooked elements of the fuel cycle such as coalmines and oil wells, in addition to the institutions and agencies that manage the system.

In taking a systems approach this research acknowledges such externalities in the decision-making process, as recognition of energy's far-reaching social, economic and environmental impacts (Stagl 2006). Furthermore, such an approach aims to identify, and where possible prevent, problems that can arise from otherwise unseen or unintended consequences by shifting the scale of focus to a global 'bigger picture' (Adams *et al.* 2013: 94). This concept builds to the idea that by bringing greater awareness of human needs and actions it is possible to improve the system overall (Bevier 2009: 202). Previous work in this area (Heffron and McCauley 2014: 435) suggested that such a system-wide focus had two implications: (1) it allowed the energy technology to be valued at full cost, and (2) this valuation would affect whether it is chosen as an energy source, with implications for energy security, the energy mix and climate change goals. This concept is developed throughout the results, as firstly the research case studies reflect on two indicative stages of the nuclear energy lifecycle represented by case studies of energy production at the Hinkley Point Nuclear Complex in Somerset, and waste reprocessing, storage, and disposal at the Sellafield Nuclear Complex in Cumbria. Secondly, chapter 7 returns to re-evaluate the importance of such an approach in light of the evidence gained.

2.8 Conclusion

This chapter started with the conceptual ambition to unite the socio-technical transition and energy literatures. Section 2.1 outlined that whilst interest in the

concept of socio-technical transitions has grown substantially (Verbong and Geels 2007), the 'socio-' or social element is frequently missing in the transitions literature and transition plans, including failures to recognise their social justice and equity implications (see Sovacool *et al.* 2016; Jamieson 2014; Markowitz and Shari 2012; Swilling and Annecke 2012; Newell and Mulvaney 2013; Goldthau and Sovacool 2012). Building on this argument, section 2.2 described the multi-level perspective (MLP) on socio-technical systems, the major transitions framework in Europe, which is frequently used to emphasise structural innovations in energy systems (Bridge *et al.* 2013). It outlined the three levels of the MLP in turn whilst considering the role of nuclear energy as an issue of on-going socio-technical change. It argued that whilst much of the existing literature on socio-technical systems has been dedicated to understanding niche innovations (Kemp *et al.* 1998; Lopolito *et al.* 2010; Smith and Raven 2012), this has come at the expense of understanding landscape dynamics, the top level of the MLP. Further, it contended that it is within this overarching landscape of socio-technical change that issues of energy justice emerge. In so doing, this section began to make the case for the concept of energy justice as a tool that can aid ethically defensible energy decision-making.

In its second half, this chapter then took a three-pronged approach to exploring the concept of energy justice: introduce, critique, and reconceptualise. Sections 2.4 and 2.5 presented an introduction to the concept of energy justice, an exploration of its roots in the environmental justice movement, and finally an overview of its three core tenets: distributional justice, procedural justice and justice as recognition. In a change from the norm, this chapter has argued for a reordering of the core tenets of energy justice in favour of distribution, justice as recognition, and procedural justice. It built upon Jenkins *et al.* (2016a) who argue for a reordering of the tenets on the logic that if injustice is to be tackled, you must (a) identify the concern – distribution, (b) identify who it affects – recognition, and only then (c) identify strategies for remediation – procedure. Thus this chapter advances a 'what, who and how' approach to tackling energy justice concerns, with the intention that energy justice

can exist as a solution-based framework that not only characterises injustices, but can also help to tackle them.

Section 2.6 then critiqued the current energy justice framework using three core variables of investigation: time, systems component and actor. It discussed, firstly, the issue of temporality within the energy justice framework, including consideration of whether energy injustices change through time, and whether the framework should remediate past injustices, act as a framework for considering future injustices, or do both. Secondly, it called into question the spatial applicability of energy justice, discussing the contexts of its current use and considering whether it is able to translate across scalar scales: local, national, international and global energy justice manifestations. Finally, this section then explored the actor of concern for energy justice, before making the case that we should not only be concerned with the victims, but in order to make a just transition, with those that are responsible for energy-decisions. It concluded that all three points are not explicit enough in current energy justice discourse, and makes a place for them in both this and future research.

Finally, section 2.7 made the case for a reconceptualisation of energy justice that includes a systems perspective at its core. It does so as acknowledgment that the full extent and diversity of justice implications within the energy system are currently neglected and that to have any real impact energy justice is required to move beyond the pages of academia into the policy domain. It is hoped that in combination with a whole-systems application of energy justice within the socio-technical systems framework this work will inform justice in practice, presenting knowledge that is essential for understanding the ways in which energy justice is constructed, understood, and tackled across a range of scales.

Chapter 3: Methods and Methodology

Having outlined the overall research question and research questions of this study in the introduction, it is necessary to situate them within the appropriate methodology. This chapter justifies the research design and describes the methodology used. Sections 3.1, 3.2, and 3.3 detail the epistemological groundings of this research, the research design and the selection of the case study approach, which is understood to provide context to the results as well as allowing for the exploration of both complementary and contrasting discourses across two research areas. Sections 3.4 and 3.5 then outline the approach taken to the two main research phases: data collection and data analysis, before sections 3.6 and 3.7 reflect on the ethical considerations and on the successes and limitations of this research.

As an opening summary, this research investigates the energy justice discourses of elite individuals and organisations, sampling representatives from the most prominent policy, industry and non-governmental organisation (NGO) groups around two specific case sites: energy production at the Hinkley Point Nuclear Complex in Somerset, and waste storage, disposal and reprocessing at the Sellafield Nuclear Complex in Cumbria. Throughout this thesis the term energy is used as a ubiquitous term, with the recognition that nuclear power creates electricity only. Due to the sampling restraints described in section 3.3, the articulations of policy and industry representatives are combined in one 'policy' group. This chapter distinguishes between an elite organisation and an elite individual, where an elite individual was not perceived as the most senior in their organisation, but was deemed to be elite through their specialism in this topic area (section 3.4.1). Discourses were gathered by semi-structured oral history interviews and analysed using discourse analysis.

3.1 Epistemological Groundings

Epistemological considerations offer a theoretical contribution to research, with, according to Carter and Little (2007), a fundamental impact on the relationship between the researcher and the participant, voice and representation, and the way in which quality of method is demonstrated. Thus, in order to justify the chosen research design and methods presented below, it is necessary to explore and clarify the main epistemological assumptions of this work, and their implications.

This research adopts a social constructivist (SC) epistemology, as is consistent with the main methodological tool, discourse analysis (Burr 2003). According to Potter (1996: 98), social constructivism sees the world as being 'constituted in one-way or another as people talk it, write it and argue it'. In this regard, social phenomena, such as the occurrence of injustices for example, are continually produced through social interaction, and are in a state of constant revision (Bryman 2015). Indeed, according to SC thought, objects *only* exist after they enter communicative space and have been socially constructed; when the ideas that define that object have been negotiated (Keaton and Bodie 2011). SC prioritises the role of language, which is seen as a pre-condition for thought. Thus language becomes a form of social action, with a 'performative' role in shaping others' conceptions. The outcome of these different constructions is seen through differentiated human action (Burr 2003). Indeed, social constructivism recognises that these meanings are varied and multiple. This is to say that any one object may carry different meanings for each individual or social group. A discourse researcher, then, must take a broad lens throughout the research, looking for complexity rather than a few ideas or categories (Creswell 2007).

In Burr's (2003) exploration of SC she identifies key characteristics of constructivist thought which inform and affect the following research design. SC is characterised as anti-essentialist in nature; thus, as the social world is an outcome of social processes,

there cannot be a determined nature of the world or people. In this respect, SC questions a realist perspective, denying that knowledge is a direct perception of reality and questioning the idea of objective fact. Knowledge is perceived, instead, as a historically and culturally specific social outcome. As a result the focus of SC is not on identifying the nature of an object per se, but on a consideration of how certain phenomena or forms of knowledge are achieved by people in interaction; on determining the process through which it is socially created (Burr 2003). This determines the focus of this research, which aims to explore articulations of energy justice.

However, whilst this research accepts SC thought, it also acknowledges natural science perspectives on energy systems. In combining a natural science (systems) perspective and a social science (policy and discourse) perspective as is discussed below, this research encounters a degree of epistemological tension. Under social constructivist thought a 'systems component' or 'stage' of the energy system is a social construct, rather than an identifiable juncture. For the purposes of this research, however, they are taken to be so as a means of comparing and contrasting stages of the nuclear lifecycle and of translating the findings of this research to non-academic audiences. Thus, in acknowledging the existence of the energy system, including its well-recognised components, this research seeks to unite, or work within the bounds of, these two bodies of thought. It does so by using the different systems components of energy lifecycles as a structured framework through which to explore the discourses of energy justice.

3.2 Research Design

This research explores discourses of energy justice throughout the nuclear energy system as articulated by members of the policy and NGO elite. As is discussed in more depth in section 3.4.1, this research makes a distinction between an elite organisation and an elite individual, where it understands elites as groups or

individuals who hold comparatively more power, privilege and political influence than lay populations, and an elite individual as someone with a specialism in this topic area. Throughout, this research samples representatives from the most prominent NGO and policy groups engaged with the research case studies. For the purposes of this work, NGOs are defined in line with Lewis (2014: 3), who identifies them as '"third sector", not-for-profit organisations concerned with addressing problems of global poverty and social justice'. Lewis identifies that these groups are normally linked with the concept of charity, while others give them more political motivations as 'civil society organisations', groups of organised citizens independent from the government or business sectors. This distinction justifies their treatment as a separate sample group from policy respondents throughout this research.

Specifically, the research asks the following overall research question and research questions:

Overall Research Question: How do elite actors within the nuclear energy system articulate energy justice?

RQ 1: How do the energy justice articulations of elite actors vary through time?
RQ 2: How do the energy justice articulations of elite actors vary according to energy systems component in question?
RQ 3: How do the energy justice articulations of elite actors vary between actors?

In sympathy with the research epistemology and resultant qualitative approach, the research design is case-study based**,** exploring energy justice discourses through two UK case studies: energy production at the Hinkley Point Nuclear Complex in Somerset, and waste storage, disposal and reprocessing at Sellafield in Cumbria. The choice of these cases is fully justified in section 3.3.2. This case study approach allows for comparisons through time, between stages of the energy system, and

between different actors – the three variables of investigation throughout this research (figure 3.1). Discourse analysis is then used to analyse the data.

The centrality of discourse throughout this research informs and justifies the research design and methodology. In line with a social constructivist epistemology outlined above, society is constituted by both written and oral language and that language produces social practice: a way of doing things (Wood and Kroger 2000). As the research field of energy justice is comparatively new and discourse fluid and dynamic, the methodology is largely explorative and inductive, where the inductive element naturally complements constructivist thought (Bryman 2015). As demanded by a discourse focus, the methods obtain qualitative data, using text based as opposed to numerical analysis (Wood and Kroger 2000; Carter and Little 2007). Throughout, discourse analysis provides an opportunity for measurement. Data is obtained via semi-structured oral history interviews, with the interview questions formed in light of the preliminary readings, the research rationale, and the research questions.

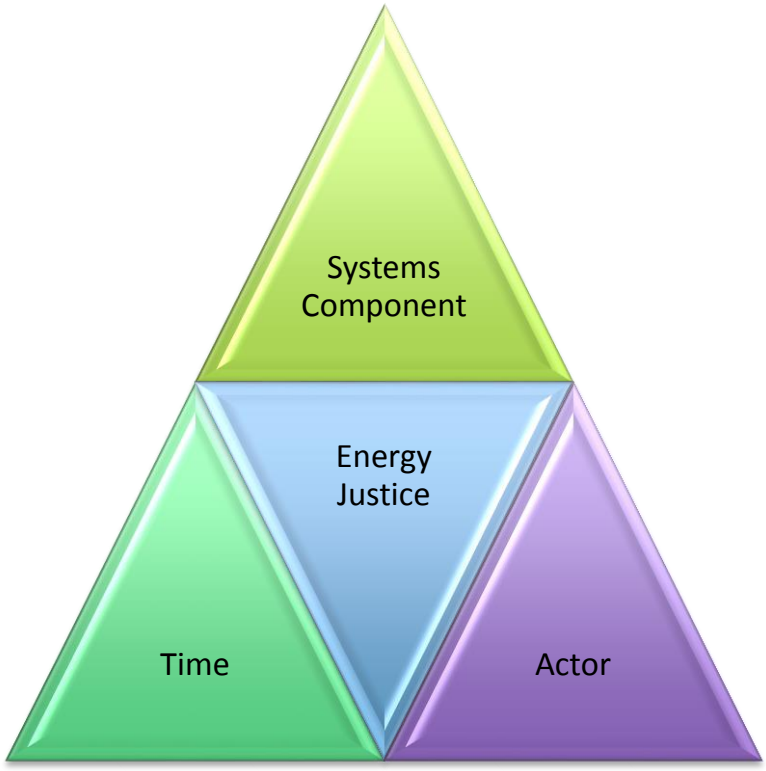

Figure 3.1 The Three Variables of Investigation

3.3 Case Study Approach

The following section justifies the case study approach used throughout this research before outlining the units of analysis – a particular nuclear facility, the Hinkley Point Nuclear Complex in Somerset, and the Sellafield Nuclear Complex in Cumbria. The research design originally included case studies in Canada and the United States as exemplars of the uranium mining and energy production stages of the nuclear life cycle. However the international case studies were not undertaken as the funding bids needed to undertake these trips were unsuccessful, leading to the prioritisation of UK cases. This process is explored in full in section 3.3.2.

Nuclear was chosen for the overall case study of this research for three primary reasons. Firstly, nuclear energy is associated with a well-known set of risks and

perceived injustices. For Sovacool (2011) these concerns include the facts that nuclear power is inherently associated with injustice through tragic global events, increased incidents of cancers, dependence on finite uranium resources, toxic pollution of the environment and terrorist threats, amongst others. Sovacool suggests that the occurrence of such injustices means nuclear power is not worth doing, well or otherwise. In examining discourses of justice around nuclear energy this research investigates whether these discourses emerge in popular discourse, and as a consequence if nuclear energy can ever be a morally defensible choice.

Secondly, it provided three points of enquiry with regards to the three key variables of investigation of this research: (1) time, (2) systems component and (3) actor. With regards to the issue of time, nuclear energy is most famous for its large, long-term infrastructure and its long lifespan, with a legacy of nuclear waste extending thousands of years into the future. Moreover, nuclear energy has an international and complex lifecycle implicating eight system components, uranium mining, uranium milling, conversion, enrichment, fuel fabrication, production, recycling and waste. This allowed exploration of the whole-systems approach advocated for in chapter 2. Nuclear energy is also famed for its divisive nature, with strong pro- and anti-factions and a traditionally hierarchical actor network with classical elites. This background allowed investigation into the extent to which these assumed energy justice discourses were different/more nuanced.

Finally, nuclear energy in the UK offered an accessible and timely case study. The UK has over 70 years of nuclear history, from the development of nuclear reactors for the purposes of creating a nuclear deterrent in the 1940s to its contemporary role as a provider of 20.8% of the UK's electricity needs (DECC 2016), providing an opportunity for the assessment of changing energy justice discourses through time. Moreover, the UK has developed a new nuclear programme with proposals for ten new reactors across five sites, with the first reactor initially expected to be in operation in 2018 (Bickerstaff 2008; Heffron 2013). This is part of a wider UK industry

strategy to deliver around 16 GW of new nuclear by 2030, with proposed facilities at Hinkley Point, Sizewell, Wylfa, Oldbury and Moorside (BIS 2013) and sits alongside on-going deliberation over the treatment and storage of UK nuclear waste. The surrounding discourses provided ample opportunity to investigate energy justice articulations. This research represents one of the first empirical investigations into energy justice as it relates to nuclear energy.

3.3.1 Rationale for Choosing a Case Study Approach

According to Yin (1994: 13), case studies emerge from the desire to understand complex social phenomena, and can be defined as 'an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between the phenomenon and the context are not clearly evident'. In this regard, a case study approach permits useful generations, enabling a researcher to seek out and explain patterns and relations that aid our understanding of the human and physical worlds (Clifford and Valentine 2003). Yin (1994) goes on to note that case studies are particularly advantageous for exploratory research which analyses phenomena over which the research has no control. As this is one of the first empirical investigations into energy justice as it relates to nuclear energy, case studies were deemed an appropriate research framework. Indeed, the exploration of two case studies allows for exploration of complementary and contrasting discourses, vastly enriching the results. Further, in examining both within-case discourses of energy justice and between-case discourses, this approach is seen to reinforce the research findings, appearing more reliable and less prone to criticisms of generalisability (George and Bennett 2005). This responds in some way to the criticism that the generality of the case is unknown and that extrapolating the findings can be seen as a matter of intuitive judgement for the investigator (Clifford and Valentine 2003).

3.3.2 Selection of Cases

The two UK case study locations selected for this research are based on a direct sampling approach. Each case was chosen as an indicative representation of a nuclear energy system component, encompassing the energy production and the waste storage, disposal and reprocessing phases. The process of identifying them and the logic behind the approach is outlined in the following paragraphs.

For Wood and Kroger (2000) energy policy often focuses on one section of the energy system to the detriment of its overall effectiveness. With an aim to contribute to energy policy, this research emphasises the wider energy system and, as discussed in section 2.7, advocates for a whole-systems approach, whereby justice implications are considered across the lifecycle of a technology, from uranium mining to waste and decommissioning. It does so on the assumption that this provides a more accurate means of capturing the true nature of justice concerns surrounding an energy form. In addition, this structure provides a guiding framework, and a means of comparing and contrasting participant perspectives. Consequently, this research aimed to sample across the nuclear energy lifecycle.

The nuclear energy system typically contains eight stages, or systems components: uranium mining, uranium milling, conversion, enrichment, fuel fabrication, production, recycling and waste (figure 3.2). Originally, the research design sought to sample internationally across this spectrum, focussing on uranium mining, energy production and waste. This followed a trend in the literature towards consideration of systems-wide social justice implications and drew on Canadian, American and British sites as exemplars of mining operations, energy production and the nuclear waste stages. Case countries were identified at this stage as the largest and most accessible contributors to the nuclear energy system, the largest uranium producer, nuclear energy producer and waste processing facility. Unfortunately, however, the funding bids needed to undertake these trips were unsuccessful, including internal

applications to the Department of Geography and Sustainable Development and the Russell Trust Postgraduate Award at the University of St Andrews, as well as external applications to the ESRC Overseas Fieldwork Fund and RGS-IBG Dudley Stamp Memorial Fund. Thus, due to time and cost restraints, this international approach was reassessed and UK case studies were prioritised. The Hinkley Point and Sellafield Nuclear Complexes then became exemplars of the production and waste phases of the nuclear cycle, removing the US and Canadian cases entirely. This iterative process, whilst time consuming, provided excellent exposure to the practicalities and challenges of large-scale research on a budget and to a deadline. Further, as is discussed in the conclusion, it opened future avenues for international investigations, including research into the justice implications of uranium mining.

Against the background of these time and cost constraints, this research focused on two of these stages in depth: energy production, and waste storage, disposal and reprocessing. These two natural science stages were chosen as the mid- and endpoint of the cycle that are most commonly cited in the literature, as well as two accessible stages of the nuclear system operating in the UK. Rather than being a limitation, the UK focus was deemed appropriate as the UK plays an on-going, fundamental role in the nuclear energy system, appearing as the oldest nuclear energy producer, formerly the largest nuclear waste-handling site, and the location of proposed new reactors, permitting insight into both past, present and future energy justice discourses.

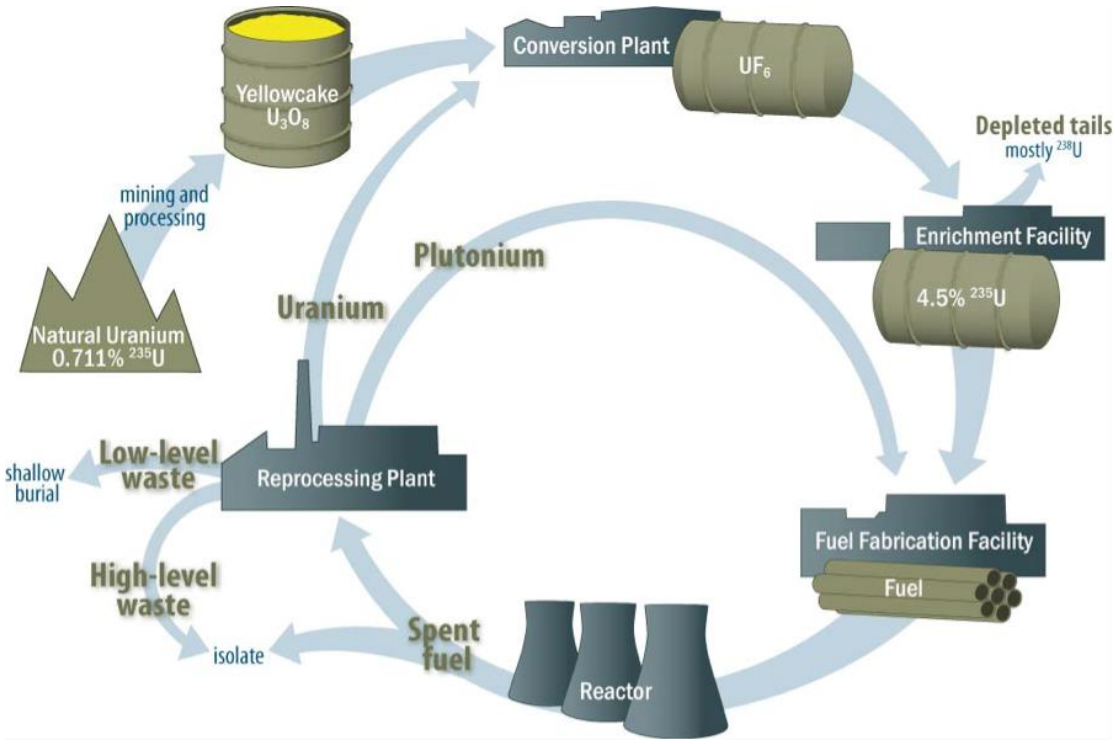

Figure 3.2 Conceptual Nuclear Fuel Cycle

(Source: Congressional Research Service 2012)

3.3.3 Units of Analysis

The unit of analysis for both of the case studies is a selected site – a particular nuclear power station complex – around which the thesis identifies the relevant policy and NGO organisations to sample from. This grounded, site-based approach not only eases the identification of key actors within the policy and NGO communities, but also increases the comparability of participant experiences as interviewees discuss the same facility. These sites within the UK were selected for their prominent role in energy production, and waste storage, disposal and reprocessing. This research identifies Hinkley Point as its energy production case study as it has both currently operative reactors and also plans for two new reactors at Hinkley Point C. Thus, whilst it is not the largest nuclear site in the UK in terms of megawatt electricity (MWe) at present, it is set to be, and provides the opportunity to explore new build energy justice concerns. Sellafield was selected for its historical

and on-going role in nuclear waste management. Background information on each case study is provided in chapter 4 in order to contextualise the findings of this research. Across these two case studies all research participants were recruited through a directed snowballing approach, maximising the researcher's pre-existing networks to ease access. This approach is expanded upon in section 3.4 within a consideration of data collection approaches. Given that developments are changing so rapidly around the proposed Hinkley Point C, this research takes a 1st of January 2016 cut-off point for new developments.

3.4 Data Collection: Semi-Structured Interviews

This research captured the energy justice discourses from the two research cases via semi-structured oral history interviews. This research is primarily interested in energy justice as a mode of policy critique, which partially justifies the actors it samples. Participants were identified at each of the two systems components of concern, energy production and waste storage, disposal and reprocessing, with particular focus on elite participants; a concept expanded upon in section 3.4.1. This section outlines the sampling method in depth.

The participants for individual, semi-structured interviews were sampled through direct snowballing, where individuals were contacted directly and either following interview, or a decline to participate, were asked to recommend appropriate alternatives (Lewis-Beck *et al*. 2004). Where possible, personal networks were used to aid the identification of participants. The researcher held previous contacts with Friends of the Earth and DECC for example, greatly aiding organisational access. The research did not aim to comprehensively cover all those whose discourses might relate to a specific case study; instead, aiming to provide a robust account of the contours of extant discourses (McDonald 2013). Therefore, a total of 36 interviews were undertaken. This was believed to represent theoretical saturation; the point at which all concepts are well developed and that no additional data was needed

(Morse 2004). Throughout, the views of participants are not taken to represent their associated organisations or peers. It was recognised that this approach has a tendency to generate perspectives similar to those of the person recommending other interviewees. However, given the sensitive nature of the nuclear industry and organisations involved, this was determined to be the best means of accessing interviews.

However, the sample obtained is not in line with the number approached. Throughout the snowballing process approximately 90 individuals and organisations were contacted with invitations to participate in the research. Of those, 36 responded and contributed. Those who did not participate cited a range of reasons, including unavailability and conflicts of interest. Representatives from policy and industry bodies were most difficult to obtain, which is taken to be an interesting insight into willingness to engage with energy justice debates in their own right. The resultant sample obtained the perspectives of policy, industry and NGO representatives, although in different numbers. As a result, the decision was made to combine industry and policy perspectives in the results chapters under the title of 'policy'. When taking this judgment, care was taken not to conflate the results of the two groups, adding researcher bias to the samples. Instead, these sections highlight contrasts and complexities in the discourses presented. The potential to refine this approach is discussed in section 3.7, the methodological reflection.

The research questions include a temporal consideration, an assessment of changing energy justice discourses through time, thus an oral-history approach to the interviews was taken. Oral histories, according to Ritchie (2003: 19), 'collect memories and personal commentaries of historical significance through recorded interview'. Such interviews 'yield rich insights into people's biographies, experiences, opinions, values, aspirations, attitudes and feelings' according to May (2001: 120). Furthermore, according to Shopes (2011), they connect the individual and the social, drawing on culturally agreed (or disputed) mental sets and modes of expression to

tell one's story. In this respect, oral history interviews recognise the social and historical nature of experiences. Such an interview can produce research with textural depth and empirical strength (Lilleker 2003), a key complement to the discourse focus of this research. Ritchie (2003: 23) reinforces this statement further, asserting that they can 'develop information that might not have appeared in print'. This despite the frequent criticism of 'accuracy of recall' effectively summarised by Sitton *et al.* (2011: 4): 'oral history is subject to all the vagaries and frailties of human recall; yet, in this respect, it is not substantially different from history as a whole, which is often distorted, subjective, and viewed through the screen of contemporary experience'.

Although framed by a broad set of questions or areas of inquiry, an oral history interview grants a high degree of flexibility, allowing the narrator to explore the chosen issues (Shopes 2011). To allow comparability between interviews, respondents were asked to reflect on the period 1986-2015, between the date of the Chernobyl nuclear accident, an identifiable, memorable juncture in nuclear history, and the present day. Within this timespan respondents were asked how their understanding or articulation of energy justice had changed and which, if any, events had prompted this. This allowed respondents to draw on their own varied expertise. Where respondents referenced events outside the sample range they were asked to make their personal timeframes explicit. Extensive research into the organisation, individual and background of the topic were undertaken before each interview to allow discussion around these points.

Throughout the interviews, participants were guided through a standard set of questions and themes, asked of each participant, whilst allowing participants to elaborate as they wished (Bryman 2015). These interview questions were formed from initial readings, the overall research aim, and the above research questions. Over a period of weeks a total of 80 research questions were developed covering the following themes: definitions of energy justice, distributional justice, justice as

recognition and procedural justice as tenets of the justice literature. These themes closely mirrored the research questions, including questions around the three variables of investigation: time, systems components and actor. Developing this wide set of questions allowed reflection on the potential breadth of topics the research interviews might cover, as well as providing opportunity for background research. It was clear, however, that as the interviews were only to last an hour that the breadth and number of questions needed to be substantially condensed. Thus a later phase of refinement was undertaken, and in total, 17 main interview questions remained (Appendix 1). This process, whilst lengthy, proved invaluable throughout the research.

As participants were chosen to represent different stages of the energy system and different elite organisational or individual specialisms, the interview questions were tailored as appropriate. It was anticipated, however, that participants would refer to other systems components and potentially, past organisational affiliations, throughout the process of the interview. Thus, where there was ambiguity over which section or group they were referring to, respondents were asked for clarification.

Where possible all interviews were taken in person, in the locations dictated by the stage of the energy system. Interviews were recorded with full participant consent, and, following temporary secure storage, later transcribed. Transcripts were also combined with written notes taken during the interview. This was done as soon as possible after the interviews in order to maximise information retention. NVivo, a platform that allows the control of audio speed, was used to aid this process. Transcription is necessitated by the ESRC funding for this research, as all data will later be submitted to Economic and Social Data Service. If requested, transcribed interviews were returned to the participants for authentication in order to ensure the most detailed and accurate account of their views.

It is reiterated at this stage that the views expressed during interviews were not taken to represent those of the participant's affiliated bodies. Thus, throughout this research the term 'illustrative' is used in an attempt to recognise elements of inherent subjectivity and data personalisation. Interview questions were also designed to explicitly detangle personal opinions.

3.4.1 Defining Elites

This research sampled elite participants specifically, making the distinction throughout between an elite organisation and an elite individual. The choice to select elites was taken in order to address a gap in the energy justice literature, which, to date, most commonly approaches justice issues from a local community, activist perspective. The inclusion of elite participants within this research was also perceived to increase its potential impact and aid its dissemination.

Despite extensive and growing literature around the definition of elites and the methodological challenges researching with them entails, the field has been criticised for its lack of a comprehensive, workable definition (Welch *et al.* 2002). According to Richards (1996: 199) an 'elite' is considered to be someone who, 'holds, or has held, a privileged position in society and as such, is likely to have more influence on political outcomes than general members of the public'. Hornby *et al.* (1983: 280), on the other hand, gives a less overtly political definition, classing the elite as 'a group in society considered to be superior because of the power, talent, privilege etc. of its members'. Providing a business perspective, Welch *et al.* (2002) draw attention to the traditional conception of elites as the top echelons of a firm – the highest management roles. Finally, but not exhaustively by any means, Lilleker (2003) adds that elite groups include primarily elected representatives, executive officers of organisations, and senior state employees. Thus, as is illustrated by this small set of examples, elites have been the focus of extensive definitional quarrels across a number of literature bases, with notable tensions around dualisms such as

the ‘powerful elite’ and ‘powerless others’ (Rice 2010: 71). There are definitional tensions too, when we consider the boundaries of this group and the unwillingness for someone to identify them as part of it. However, despite differences in definitions, perspectives are united by the idea that elites hold more power, privilege and political influence than lay populations.

For the purpose of this research the distinction was made between an elite organisation and an elite individual. On an organisational level, the above definition is widened to include not only explicitly political and business bodies as the traditional elite, but NGO and industry. This research samples representatives from the most prominent policy and NGO groups engaged with the research case studies – those for which the facilities in question were a direct concern of their work. NGOs are defined in line with Lewis (2014: 3), who identifies them as ‘third sector, not-for-profit organisations concerned with addressing problems of global poverty and social justice’. Lewis identifies that these groups are normally linked with either the concept of charity, while others give them more political motivations as ‘civil society organisations’, groups of organised citizens independent from the government or business sectors, hence their treatment as a separate group throughout this research. All are classified as elite due to their perceived influence, power and voice in political proceedings. NGOs such as Stop Hinkley, for example, adopt a commentary and advocacy role, and industry organisations such as Électricité de France (known as EDF throughout) have undeniable political influence. Attention was paid throughout, however, to the idea that these organisations may not consider themselves as elites and may be uncomfortable with this label, requiring sensitivity from the researcher. An NGO, for example, may perceive their classification as elite to go against their very ethos.

On an individual, participant, level this research rejects what Welch *et al.* (2002: 626) identify as the ‘higher is better’ fallacy; the idea that we should always aim for the highest, most prominent individuals. Instead, interviewees and organisations were

selected primarily for their ability to answer the research questions. An elite individual, therefore, was not perceived as the most senior in their organisation, but was deemed to be elite through their specialism in this topic area. This approach led to the sampling of both individuals conceived as traditionally elite – the campaigns manager of Friends of the Earth, for example – and those that may not have otherwise fallen into this category, including community relations officers for the Nuclear Decommissioning Authority (NDA).

It is widely recognised within the literature that researching members of the elite raises unique methodological challenges. This includes, for Welch *et al*. (2002) and Cormode and Hughes (1999) power asymmetries between the interviewer and participants: issues of positionality around age, gender and status, for example (McEvoy 2006). From the outset this was recognised as a particular peculiarity of this research. Conducting interviews with members of elite policy and NGOs organisations required self-awareness of the researcher's identity. Undertaking interviews with a senior member of an elite political organisation as a young, female researcher, for example, was taken to present fundamentally different challenges to researching with senior members of NGOs. Speaking to similar experiences, McEvoy (2006: 185) states 'that as a young female I was aware of the "male space of politics" and that my gender would probably have an effect on the attitudes of the respondent, given that the majority of respondents are male and middle-aged'. Care was taken, therefore, not only to dress appropriately for interviews with each group, but also to undertake thorough background reading before the interview so that the researcher appeared knowledgeable and expert; overriding, to some degree, what McEvoy experienced as the tendency for some participants to be somewhat disdainful. Moreover, in the case of this research, this asymmetry occasionally included the researcher's personal attitude to nuclear energy. Conscious of this potential bias, the researcher sought to provide an impartial account of the energy justice themes surrounding the energy form, permitting insights that move beyond classical pro- and anti-nuclear critiques.

3.5 Data Analysis

3.5.1 Discourse Analysis as Theory

In line with the discourse focus throughout this research, discourse analysis was used as the main analytical tool. Discourse analysis (DA) is a well-tested and popular form of enquiry. Incorporating insights from philosophers including Michel Foucault. DA is concerned with 'the way in which linguistic categories relating to an object and the ways of depicting it frame the way we comprehend that object' (Bryman 2015: 499). In this respect, discourse studies believe that discourses form a version of that object's reality, as is the case with social constructivism. Thus, natural, physical and cultural objects become 'discursively constructed' (Glynos *et al*. 2009). A discourse is a textualised or verbalised statement about the object in question, which can be spoken, written or even illustrated (McDonald 2013). These communicative events encompass beliefs, ideologies, identities, politics, and the like, which provide the basic terms for analysis, debate, agreement and disagreement about an object (Rahimi 2011; Glynos *et al*. 2009). Such social information is not often expressed explicitly, and is of particular concern for discourse analysts (Rahimi 2011). With little emphasis on naturally occurring talk, research interviews can be a legitimate target for discourse analysis (Bryman 2015). This research focuses on oral discourses converted to transcribed texts, as is most conducive to the elite actors that advance them (McDonald 2013).

The constructivist underpinnings of DA recognise that dominant or hegemonic discourses – energy injustice as an outcome of primarily distributional concerns as an unfounded example – are just one of many viable renditions, and that it is during the process of becoming dominant that a certain reality is created (Bryman 2015). According to Hajer (1995: 60), where they do become dominant 'they can define terms of debate about particular issues, become incorporated into political institutions, or require actors seeking credibility in a given domain to draw in the

ideas, concepts and categories of a given discourse'. Discourses, therefore, can provide philosophical anchoring for claims about subsequent responses, leading to real action. In McDonald's (2013) exploration of climate change, this is why discourse analysis is revealing; it allows the recognition of different interpretations of climate change for example, legitimises the actors undertaking responses, and defines the terms of debate itself. The same is true of explorations of energy justice.

Discourse analysis is seen as a theoretical perspective and methodology, which incorporates contributions from the fields of both linguistic and social analysis, rather than a set method (Nikander 2007; Rahimi 2011). Indeed, within this field DA encompasses a broad spectrum of techniques; Glynos *et al*. (2009) identify six dominant approaches for example, encompassing political discourse analysis, interpretive policy analysis, rhetorical political analysis, discourse historical approaches in critical discourse analysis, discursive psychology and Q methodology. These approaches vary widely, with critical discourse analysis frequently focusing on the macro-details of texts, while political discourse theory tends to take a much wider lens (Glynos *et al*. 2009). Furthermore, according to Rahimi (2011) some analysts do not follow any procedure for rigorous analysis, searching instead for patterns that may be linked to social or power structure and ideological colourings. Nevertheless, DA approaches are all concerned with implicit information, and the strategies used to create different 'realities'. DA, therefore, is often action-oriented, with a focus on how things are done. This is clear via the consideration of three basic discourse-analytic questions: what is the discourse doing? How is this discourse constructed to make this happen? What resources are available to perform this activity? (Potter 2004). This research explores these questions through rhetorical political analysis, the approach to which is outlined below.

3.5.2 Rhetorical Political Analysis

Of the many forms of discourse analysis, this research focuses on rhetorical political analysis. For Barry *et al.* (2008: 68), 'rhetoric concerns both the practice and study of effective and persuasive communication with a specific purpose or intent on behalf of the speaker or writer'. It is in this regard rhetorical analysis is concerned with argumentation – the tools used to achieve dominant or hegemonic discourses regarding a particular object (Glynos *et al.* 2009). Indeed, Hauser (2002: 3) comments that the use of rhetoric 'is not communication for communication's sake; rhetorical communication, at least implicitly and often explicitly, attempts to coordinate social action'. Thus it has pragmatic intent and aims to influence human choice (Barry *et al.* 2008). Discourse approaches focus on the persuasive and morally consequential aspects of language's use (Nikander 2007). Table 3.1 describes the different forms of argumentation strategies used. Such analysis helps identify the resources, devices and technique employed to create an argument, as well as, according to Barry *et al.* (2008: 71) 'the moral standing of the speaker/proposer, the justness or rightness of her argument and the unjustness or irrationality of other positions, arguments or viewpoints'.

Type of Argument	Object of Argument	Strategy
Conjecture	Facts	Dispute is factual – whether or not something is the case
Definition	Naming	Concerned with the naming of things
Quality	Nature of an act	The nature of an act, and calls for judgement.
Place	Boundaries/staging	Attempt to set the boundaries of political argument

Table 3.1 Rhetorical Political Analysis Outline
(Adapted from Thomas and Harden 2008)

Along with attention to these particular strategies, Billig (1987: 91) stresses the importance of knowing the surrounding 'argumentative context'. This requires attention to the positions that are being criticised or being employed to support an argument, without which the wider argumentative meaning may be lost (Barry *et al.* 2008). The use of rhetorical analysis within any qualitative research, therefore, requires a thorough understanding of the surrounding topic area and relevant history.

Epistemologically and conceptually, rhetorical policy analysis is perceived to be sympathetic with the methodology, methods and aims of this research. Barry *et al.* (2008: 69) state, for example, that:

> *'(Most) policy and political developments, proposals and interventions rarely enjoy consensus but either reflect or reproduce underlying social dissensus. This is particular the case with technologically-based economic innovation which invariably generates 'winners' and 'losers', as well as often raising difficult ethical questions and leading to value-base political debate and conflict'.*

Indeed, Barry *et al.* (2008) go on to write that after understanding how a protagonist relays their aims, concerns and fears, we gain a greater understanding of the positions underlying them. Thus, they claim, we can establish a starting point of a conflict resolution process. Whilst this research does not aim to resolve conflict per se, this contribution is seen as directly relevant to policy and academia as we strive to create just energy systems, the foundations of which are created thorough an understanding of the differing perspectives held on what constitutes energy justice.

3.5.3 NVivo Analysis

Once transcribed and collated the interview transcripts were analysed using NVivo. In line with Thomas and Harden (2008: 8) from the ESRC National Centre for Research Methods, the process was seen to comprise three stages, (1) the free line-by-line coding of data sources, (2) the organisation of these 'free codes' into 'descriptive' themes and (3) the development of 'analytical' themes. This process is further described in the following paragraphs.

Line-by-line Coding: During this early phase excerpts, quotations and passages were coded into themes, categories and case examples according to their meaning and content (Labuschagne 2003; Thomas and Harden 2008). These include, by way of an example, disruption during infrastructure development; health and safety; jobs and education; radioactive contamination; military usages; and planning for contemporary and legacy wastes. These themes and categories were initially designed to mirror the interview question topics, definitions of energy justice, and distribution, procedure and recognition as tenets of the justice literature. Throughout the phase of interview analysis piloting these categories were inductively developed to create a matrix of 'nodes' that described the content of the data sources. They included, for example, the energy form and systems component referenced.

Construction of Descriptive Themes: At this stage, following exploration of similarities and differences between the emergent codes, new group codes were created that captured the meanings of codes within them. A total of 34 descriptive themes emerged which summarised, for example, all codes pertaining to the risks of nuclear energy.

Development of Analytical Themes: The discourse focus of this research requires not just a record of conceptions of energy justice, but understanding their

construction and articulation. This stage of the process therefore follows Thomas and Harden's (2008) strategy of 'going beyond', a stage they liken to meta-ethnography's development of 'third order interpretations' (Campbell *et al*. 2003). This requires a move beyond the descriptive themes achieved above to create additional concepts, understanding or hypotheses (Thomas and Harden 2008). Referring back to rhetorical political analysis, this phase, then, included exploration of the different argumentation strategies used to articulate energy justice and inferred the moral and value-based assumptions behind them. The results are presented in chapter 7.

Overall, this analytic approach to the data analysis not only allowed for in-depth exploration of the texts but of comparisons between the three variables of investigation, demonstrating how data vary according to the time, systems component and actor in question. In doing so it addressed how energy justice is being constructed and articulated more generally, answering the overall research question.

3.6 Ethical Considerations and Implications

This research dealt with potentially sensitive information, high profile participants and a highly controversial topic, thus it raises numerous ethical considerations. As a first step towards consideration of these ethical issues, ethical approval was sought from the University of St Andrews Teaching and Research Ethics Committee (UTREC) prior to undertaking this research (Appendix 2). Before participating, interviewees had the opportunity to read a Participant Information Form detailing the purpose and intentions of the study before each interview and, following reading, were asked to sign a Consent Form before agreeing to take part. Furthermore, all participants were made aware that they could omit answers and withdraw from the interview at any time. In the eventuality of incomplete interview transcripts, participants were made aware that their dialogue could still be analysed unless requested otherwise. Due to the identity of participants and their affiliations, particular care was taken to

offer anonymity where possible. It was made explicit throughout that the views of participants are not taken to represent their associated organisations or peers.

Alongside traditional concerns of participant harm, informed consent, anonymity and confidentiality, the ESRC funding attached to this research brought particular data management requirements. All data created or repurposed throughout this PhD had to be submitted to the Economic and Social Data Service (ESDS), and is now available for future reuse. All participants were made aware of this condition before the interview began.

3.7 Methodological Reflections and Limitations

This section reflects on the methodological process, highlighting research areas that could have benefitted from refinement. It reflects in particular on the research limitations of data collection, both in terms of sample case studies and sample representatives, and on the validity of discourse analysis. These reflections are consistent with PhD level work and wider social science study and, as a result, are not critiques of this study per se. Instead, they are framed positively as areas of future research, building on the strong foundation of empirical findings and publications already produced from this thesis.

Firstly, as is discussed above, this research took place under both time and financial restrictions, eliminating the possibility of investigations into energy justice discourses around uranium mining in Canada and the inclusion of the United States as a research location for nuclear energy production. Thus, this research may be criticised for its inability to capture discourses of energy justice outside of the UK, and at the front-end of the nuclear energy system. To counteract this, this research prioritised the depth of case studies rather than the breadth. This criticism was also overcome, to some degree, as respondents referred to other nuclear systems components when forming their answers. However, as is introduced above, future research could

engage with international investigations, including the missing uranium mining case. In so doing, there is potential to close the energy systems loop and develop source-to-sink energy justice evaluation.

Secondly, this research confronted issues of obtaining equal representative samples from each of its initial research groups, policy, industry and NGO, where representatives from policy and industry bodies were most difficult to obtain. As a result, the decision was made to combine industry and policy perspectives in the results chapters under the title of 'policy'. Although care was taken not to conflate policy and industry perspectives within this grouping, their treatment as stand-alone participant samples would have created more nuanced findings. Thus, future research in this area would benefit from taking more discrete industry or policy stances. It is recognised that this would be possible given a longer research timespan and with stronger pre-existing research networks, which are especially important given that the UK nuclear sector is currently highly-studied and politically charged.

Finally the use of DA itself may be refined. Dryzek (2005) notes in his analysis of environmental discourses, that there are always alternatives to any discourse groupings. Similarly, distinctions between frameworks of meanings are often imperfect and permeable (McDonald 2013). In this regard, DA is always a matter of interpretation, with no hard data or definite answers. Indeed, by engaging with discussions about energy justice, the researcher is unavoidably, partially creating it, and analysing responses through the lens of their own experience. This is perceived to be an inescapable fact of social science more generally. Where possible, however, future studies in this area would be conducted by a research team rather than an individual, permitting triangulation of the results.

Chapter 4: Background to Case Studies

To set the context for the results and discussion this chapter provides background information on nuclear energy in the UK (section 4.1) and the two case studies: energy production at the Hinkley Point Nuclear Complex in Somerset (section 4.2), and waste storage, disposal and reprocessing at the Sellafield Nuclear Complex in Cumbria (section 4.3). It offers both countrywide and site-specific detail, alongside an introduction to potential energy justice concerns on the basis of events and current discourses. Specifically, the sections below give context to the UK as host to the oldest nuclear programme in the world, to what was formerly the largest nuclear waste-handling site, and the location of proposed new reactors, illustrating that this background permits insights into past, present and future energy justice discourses throughout this research. As outlined in section 3.3, each case study was chosen as a logistically accessible indicative representation of a nuclear energy system component. The unit of analysis, a particular site, also allowed for the identification of relevant policy, industry and NGO organisations to sample from, and increased the comparability of participant experiences whenever interviewees discussed the same facility. The policy, industry and NGO divide brings an assumed starting point of pro- and anti-nuclear attitudes. However, as the results presented in chapters 5 and 6 demonstrate, the energy justice concerns around nuclear power appear more nuanced.

In addition to insight into the evolution of UK nuclear energy policies and site-specific contextual information, this chapter also provides a brief introduction to the core policy, industry and NGO groups around each of the two case-study locations. The organisations listed are the predominant stakeholders in the operation and oversight of each case facility, and therefore the target sample for this research. However, as outlined in section 3.4, this research took a direct snowballing approach whereby individuals were contacted directly and either following interview or a decline to participate, were asked to recommend appropriate alternatives. As this is the case,

the stakeholder groups introduced below do not provide an exhaustive account of the individuals and organisations represented in the research sample. Instead, these are the primary groups from which other research participants were recommended and identified. Full details of the participants and their affiliations, where given, are provided in table 5.1 and table 6.1 of the associated results chapter.

4.1 UK Nuclear Context

The UK has over 70 years of nuclear history, from its development of nuclear reactors for the purposes of creating a nuclear deterrent in the 1940s, to its contemporary role as a provider of 20.8% of the UK's electricity needs (DECC 2016). Whilst it is outwith the scope of this section to provide an overview of this period in its entirety, it delivers a high-level overview of three main phases of nuclear development in the UK: (1) 1940-1960: research, weapons and Magnox reactors, (2) 1960 – 1990: review of the industry, advanced gas-cooled reactors (AGRs) and pressurised water reactors (PWRs), and (3) 1990 – to the present: civil nuclear and the nuclear renaissance. In so doing it provides broad context to the results, and highlights relevant changes in nuclear policy and discourses. This information contextualises many of the statements made by the research participants, as presented in chapters 5 and 6. This three-stage framework is an adaptation of the six-stage model used in the Chartered Quality Institute's history of nuclear energy, which has been altered to provide energy-specific information, thereby reducing the focus on the militarisation of nuclear power (McNair 2013).

4.1.1 1940-1960: Research, Weapons and Magnox Reactors

The UK was a pioneer in the development of the global nuclear power programme both before and after the Second World War, making the UK's nuclear program one of the earliest in the world (Davis 2009). The MAUD Committee, an independent scientific body established in 1939, developed the UK's nuclear energy programme

throughout 1940 and 1941 under a project called 'Tube Alloys'. Later, the UK cooperated with the 1943 Quebec Agreement, part of the USA's Manhattan Project, an American scheme to develop a nuclear weapon, which led to the atomic bomb being dropped in Hiroshima and Nagasaki, Japan. Thus, Taylor (2016) identifies two foundations for Britain's pioneering role in nuclear power, firstly its long-standing nuclear research record, including the world's first artificial nuclear fission reaction in 1932, and secondly the involvement of British scientists in the development of nuclear bombs. Following the UK Government's initial interest in nuclear weaponry, the Atomic Research Centre was established in 1946 at Harwell, Oxfordshire, creating the first experimental reactor. The new facility, the Graphite Low Energy Experimental Pile (GLEEP) began operating in 1947. In the same year that GLEEP came on line, the UK began developing its own atomic bomb using weapons grade uranium produced at Capenhurst, Springfields and Windscale in England (NIA 2013; Davis 2009; McNair 2013). In this respect the UK's nuclear programme began with distinct military origins.

Alongside the use of nuclear technologies for the production of weapons grade plutonium, it was later realised that nuclear reactors could also form the basis for electricity generation, marking the start of the civil nuclear energy programme in Britain (NIA 2003; Davis 2009). According to Taylor (2016: 1), this 'brought high hopes for cheap electricity, energy security, and export success'. In 1954, the Atomic Energy Authority Act established the United Kingdom Atomic Energy Authority (UKAEA), which took responsibility for developing this infrastructure. The first commercially operative civil nuclear power plant was Calder Hall within the original Windscale complex, which began producing energy in 1956 and became the forerunner for nine Magnox stations across the UK, a now-obsolete reactor design. The Central Electricity Generating Board (CEGB) in England and Wales, and the South of Scotland Electricity Board (SSEB) in Scotland (McNair 2013) operated the facilities. This 1950s drive towards a civil nuclear power programme coincided with the UK's drive for economic recovery post World War Two and represented a means of

diversifying the UK economy during a time that the UK remained heavily dependent upon indigenous coal production (NIA 2013; Chesshire 1992). However, despite the early successes of the nuclear programme, public opposition began to increase as the Windscale Pile fire in 1957 led to concerns about the safety of nuclear reactors (section 4.3.2), concerns further compounded by the UK's nuclear bomb test (Pidgeon *et al*. 2008; Taylor 2016). Latterly, this fall in favour led to a re-evaluation of the UK's nuclear energy policy.

4.1.2 1960s Review of the Industry, AGRs and PWRs

Following a review of energy policy in 1963 there was a notable change in tack for the nuclear industry. Subsequent to the review, the 1964 government White Paper, 'The Second Nuclear Power Programme', established a second wave of UK nuclear investment, heralding the shift from Magnox reactors to AGRs. The UK's selection of the AGR went against the trend of the US, France and Japan, who built light water reactors (LWRs), pressurised water reactors (PWRs) or boiling water reactors (BWRs) (Davis 2009). In total, five new AGR reactors were built in England – Dungeness B, Hinkley Point B, Hartlepool, Heysham 1 and Heysham 2 – alongside two reactors constructed in Scotland – Hunterston B and Torness (McNair 2013). In tandem with the shift to new nuclear reactor designs, the UKAEA was restructured to focus on research and development, with the aim that a single company would be responsible for design and construction, and another for new fuel supply and manufacturing (McNair 2013).

In the 1980s, the PWR was selected for the next round of nuclear development in the UK under the direction of the Margaret Thatcher Conservative government (1979-1990), who planned to build ten new stations. These reactors were intended to reduce dependence on coal mining, protecting against the insecurity of supply caused by trade union strikes (Davis 2009), as well as to buffer the risk of high oil prices following the Iranian Revolution of 1979-1980 (Taylor 2016). However, only

one plant was ever constructed, Sizewell B in Suffolk, which began operating in 1988 and proved to be the last station to date to be constructed in the UK. Plans for a successive facility at Hinkley Point C were scrapped due to uncertainty around the proposed new electricity market and safety concerns following the Chernobyl accident in 1986 (Davis 2009). Davis (2009) goes on to identify that in the following decade two significant events prevented further investment in new nuclear power: the development of combined-cycle gas turbine technology, which rapidly decreased the cost of gas power station electricity supply, and the privatisation of the electricity supply industry. Thus, despite early growth the nuclear industry fell out of favour.

4.1.3 1990s to Present: Civil Programme and Nuclear Renaissance

During the 1990s and early 2000s, government energy policy fluctuated as a consequence of the privatisation and reorganisation of the industrial sector. During these rearrangements the CEGB and SSEB were phased out in favour of British Energy, who from 1996 onwards operated the AGR and PWR stations. The older Magnox sites were not commercially viable, and as a result remained under public ownership via Magnox Electric, which later merged with British Nuclear Fuels Ltd (BNFL) and finally became BNFL Magnox Generation (Taylor 2016). Today the UK operates 15 nuclear reactors, with a further 29 already undergoing decommissioning (Bolton 2013). There are three types of units remaining, the AGRs, two Magnox Reactors, and one PWR (Heffron 2013). In 2015 nuclear energy production in the UK totalled 20.8% of the total energy mix (DECC 2016). Alongside electricity production, the UK's nuclear sector also includes non-power-producing facilities, including those reprocessing nuclear fuel, the decommissioning of nuclear infrastructure, defence facilities, and nuclear new build (ONR 2013). The inclusion of new build nuclear represents a tide change in UK nuclear policies.

Nuttall and Earp (2014) identified that since 2006 UK policy has moved consistently and strongly towards incentivising new nuclear. This change reflects the national

desire for energy independence, and a long-term shift towards green, low-carbon technologies (Florini and Sovacool 2009; DECC 2011b; Watson and Scott 2009); a transition driven, in part, by the prospective energy gap caused by existing facilities coming to the end of their operational lifespans. In essence, new nuclear power has two roles: (1) to replace ageing energy infrastructure, and (2) to contribute to climate change targets. Indeed, plans for future decommissioning mean that by 2020 the UK's total nuclear capacity will have reduced by around three quarters (BERR 2008; Bickerstaff *et al.* 2008). Even with lifetime extensions on some pre-existing facilities, new energy production infrastructure will be required.

The government's 'Meeting the Energy Challenge: A White Paper on Nuclear Energy' highlights a public shift in attitudes towards nuclear energy and makes the case that new nuclear power stations have a role to play in this future electricity-generating mix alongside other low-carbon sources, as a means of 'tackling climate change' and 'ensuring secure, clean and affordable energy' (BERR 2008: 6; Jenkins *et al.* 2016b; Bolton 2013; Heffron 2013). As a result, the UK has developed a new nuclear programme that envisages ten reactors being built on five sites in the UK by three different companies, with the first reactor initially expected to be in operation in 2018 (Bickerstaff 2008; Heffron 2013). This is part of a wider UK industry strategy to deliver around 16 GW of new nuclear by 2030, with proposed facilities at Hinkley Point, Sizewell, Wylfa, Oldbury and Moorside (BIS 2013). These proposed developments have been dubbed part of Britain's 'nuclear renaissance' (Johnstone 2014). Taylor (2016: 2) writes that in enthusiastically promoting new nuclear builds the government sought to create a vision where 'new nuclear would be built without subsidy, and a new generation of safer, more efficient plants would be competitive in a market that factored in the price of damaging carbon emissions'.

For Scotland, whose partially devolved government gives it autonomy over its energy infrastructure, the low-carbon drive does not include nuclear energy. England, however, has begun nuclear redevelopment, with the first of the new nuclear

reactors being the EDF-led development at Hinkley Point in Somerset. If completed, these will be the first new reactors since Sizewell B (Bickerstaff *et al.* 2008). However, as is outlined in more depth in section 4.2.3, there have been successive delays in the development of the new facilities and there is no indication of when the first might become operational. Consequently, there is increasing scepticism as to whether they can play a role in filling the energy gap. Alongside the controversies concerning these delays, Nuttall and Earp (2014) also identify that in the drive for new nuclear some long-standing axioms of policy have been quietly dropped. This includes the commitment to no special subsidy for nuclear power. The uncertainty of future developments and the high levels of public discourse around these proposals are seen to provide an excellent backdrop for the results of this research, which occur around the two case studies: the Hinkley Point Nuclear Complex in Somerset, and waste storage, disposal and reprocessing at the Sellafield Nuclear Complex in Cumbria. Each case study is introduced below.

4.2 Energy Production, Hinkley Point Nuclear Complex

The following sections outline the potential energy justice concerns around the Hinkley Point Nuclear Complex on the grounds of both discourses and events. These sections also introduce the predominant policy, industry and NGO organisations involved in the operation and oversight of the complex. The Hinkley Point Complex in the West Somerset District of the County of Somerset, Southwest England, is comprised of two pre-existing reactor facilities: Hinkley Point A, which is undergoing decommissioning, and the currently operative Hinkley Point B. Both sites are adjacent to the building works for the first of the UK's proposed new reactors, Hinkley Point C (Magnox 2014). Situated 25 km to the east of Minehead and 12 km to the North-West of Bridgwater, the permanent nuclear power development site, including pre-existing infrastructure and that which is currently being developed, will eventually cover 69 ha of land (EDF 2009a). The site is surrounded by land that is deemed to be of high ecological value; for example part of the site borders the

Bridgwater Bay Site of Special Scientific Interest (SSSI) (NDA 2006). Figure 4.1 shows the location of the complex in relation to local towns and villages referenced in chapter 5. Sections 4.2.1 to 4.2.3 give brief histories of each of the stations, A, B, and C. Finally, appendices 3 and 4 provide an overview of their development timeline and management structure.

Given the focus on energy production as a distinct stage of the nuclear lifecycle, it primarily focuses on the energy justice discourses surrounding Hinkley Point B. However, Hinkley Point C, which will undergo construction subject to financial agreement, is included in this research on the grounds of its role in contemporary energy politics, and the relevant interest of its on-going energy justice implications. Further, it provides insight into the energy justice implications of the site selection process for nuclear new build, as part of the energy production process. Given that developments are changing so rapidly around the proposed Hinkley Point C, this research takes a 1st of January 2016 cut-off point for new developments. Information on Hinkley Point A is included as background on the development of the complex only, and by means of illustrating its long-term influence on the local area.

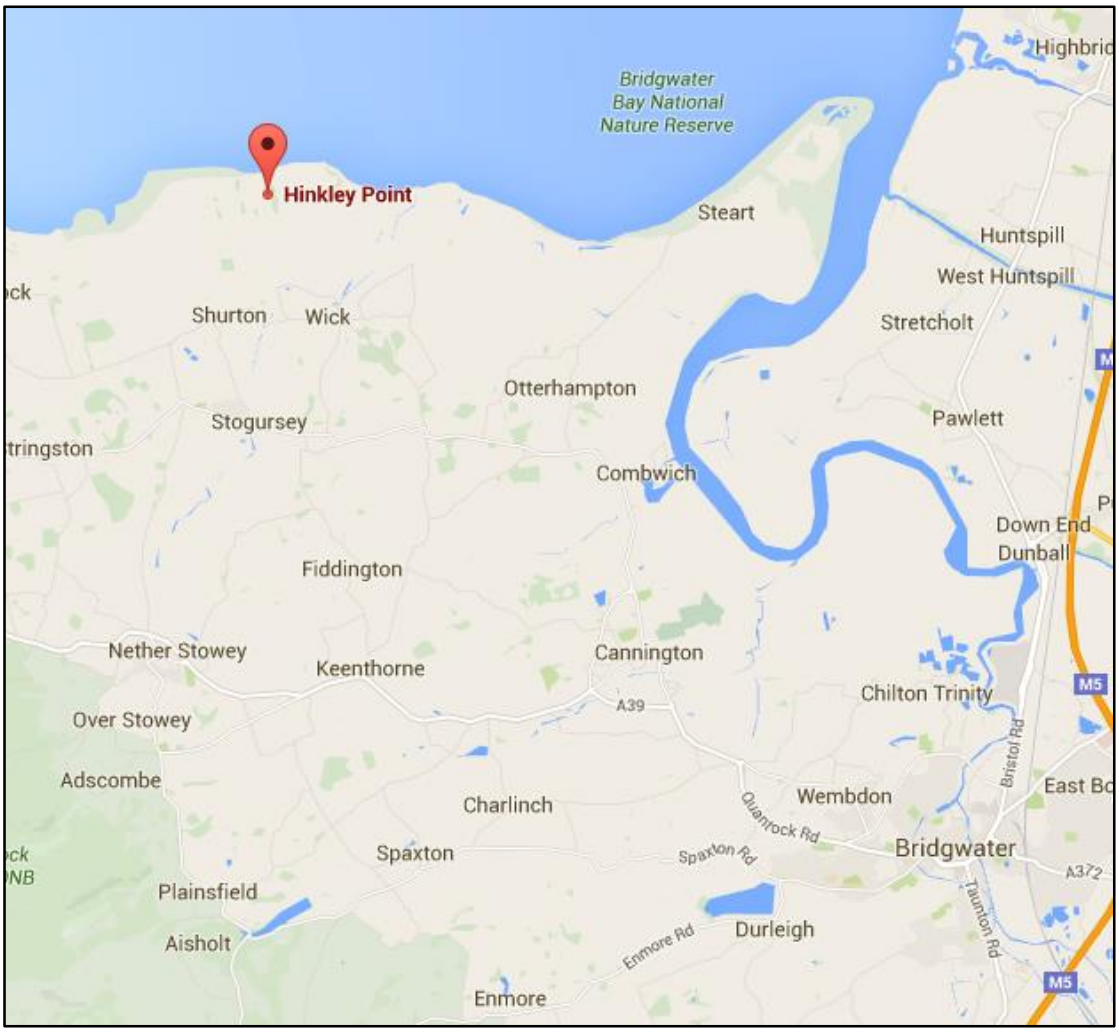

Figure 4.1 Location of Hinkley Point Nuclear Complex

(Source: Google Maps)

4.2.1 Hinkley Point A (Operative 1965-2000)

The following information on Hinkley Point A is included as background on the development of the site only, and by way of illustrating its long-term role in the local area. The facility is not a direct case study for this research, which instead focuses on Hinkley Point B and Hinkley Point C as both current and future energy producers.

As part of the move to diversify the UK economy during a time where the UK remained heavily dependent upon indigenous coal production, the first round of

Magnox power stations development was led by the Central Electricity Generating Board (CEGB) (Chesshire 1992). Amongst these developments was the construction of Hinkley Point A, which began in 1957 and first contributed electricity to the grid in 1965 (Magnox 2014). During its operational lifespan, 1965-2000, the Hinkley Point A site housed a twin Magnox station with a combined output of 470 MW per annum, or 103 TWh of electricity in total. Producing throughout the privatisation of the UK energy sector, the reactors were initially owned by the CEGB before Nuclear Electric and finally Magnox Electric Ltd, who retained ownership of the facility until it was transferred to the Nuclear Decommissioning Authority (NDA) following its closure in 2000 (NDA 2006).

The decommissioning process at Hinkley Point A is split into four stages: (1) defueling, (2) care and maintenance preparations, (3) care and maintenance, and (4) final site clearance. The first stage, defueling, took place between 2000 and 2004, during which 71,828 spent fuel elements were removed and sent for reprocessing. Intermediate Level Waste (ILW) is retained on site for interim storage (NDA 2006). Following the completion of defueling and an intermediary phase of preparation, the site entered a care and maintenance process, composed of monitoring and remedial work. The site will now remain in this passive state for around 80 years, throughout which the facilities are monitored to ensure safety and minimise their environmental impact. This period is designed to permit the natural radioactive decay of the reactor materials following which they are safer to handle. This phase of care and maintenance is expected to extend until around 2095, when final demolition, clearance, and land remediation can take place (NDA 2006).

The current storage of Intermediate Level Wastes (ILW) at Hinkley Point A is contingent on the development of a national repository. Only once it is developed will the stored waste on-site be removed and the storage facilities demolished. Such a facility is planned to become available in 2040, with the disposal of Hinkley Point A's ILW set to take place between 2046 and 2048 (NDA 2006). The development of a

geological disposal facility is outlined in more depth in section 4.3.4. Table 4.1 provides a summary of the decommissioning developments at Hinkley Point A and the processes they entail.

Key Phase	Focus Area	Timespan
1. Generation	Statutory requirements	1965-2000
	Generation	
	Generation throughput Improvements	
2. Defueling	Statutory requirements	2000-2004
	Defueling preps	
	Defueling	
	Defueling throughput improvements	
3. Care and Maintenance Preparations	Statutory requirements	2004-2014
	Waste removal or packaging	
	Facility clean-up	
4. Care and Maintenance	Statutory requirements	2014-2095
	Monitoring	
	Remedial Work	
5. Final Site Clearance	Statutory requirements	2095-2104
	Demolition and Clearance	
	Land Remediation	

Table 4.1 Hinkley Point A Site Treatment Phases
(Adapted from NDA 2006)

Given that the facility is in its long-term care and maintenance phase with only monitoring check-ups, Hinkley Point A is not commonly mentioned in public discourse, in contrast to the currently operative Hinkley Point B and the proposed Hinkley Point C stations. The processes and actors present at these sites are outlined below.

4.2.2 Hinkley Point B (Operative 1976-Present)

The Hinkley Point B station was constructed during the second wave of UK nuclear investment, which saw the shift from Magnox reactors to AGRs. Hinkley Point B was amongst the first of these new AGRs to undergo construction, opening in 1976, a few years before the Three Mile Island accident of 1979 (Grimston *et al.* 2014). Hinkley Point B, which remains operative today, is the main subject of the energy production case study of this research. The following paragraphs give an overview of the processes undertaken at the site, its ownership model, and the core actor groups involved in its operation, who represent the target sample groups.

The Hinkley Point B power station is situated immediately to the east of Hinkley Point A and is run by EDF Energy Nuclear Generation Ltd, a subsidiary of the French-based company Électricité de France (EDF) (Magnox 2014; EDF 2012). For its nuclear fleet and developments EDF is partnered with Centrica, who have a 20% stake in the company's 15 reactors, which are split across eight plant sites throughout the UK. This includes a share in the pre-existing reactors at Hinkley Point B. EDF are the public face of the Hinkley Point facility and one of the most prominent industry groups in the Somerset area, employing approximately 535 full time EDF Energy employees and around 200 contractual workers (EDF 2016).

Hinkley Point B itself is composed of twin AGRs known as Reactors 3 and 4 (ONR 2016a). Construction began in 1967, before contributing electricity to the grid in 1976. Originally destined to operate until 2016, the plant was granted a seven-year life-span extension in 2012, extending its operating date until 2023 (EDF 2009a; EA 2013).

The Department of Energy and Climate Change (DECC) is the lead department for the management of radioactive and nuclear substances in the UK, as well as for the disposal of radioactive waste. The Office for Nuclear Regulation (ONR) regulates

operations at Hinkley Point B and is responsible for ensuring site safety and security. The ONR is concerned with the continued safe, reliable operation of the reactors, which require examination, inspection, maintenance and testing, alongside plant upgrades where reasonably practicable (ONR 2016a). Thus, their primary concerns are for the technical operations of the facilities. Alongside the ONR, the Environment Agency (EA), the principal environmental regulator of the nuclear industry in England, oversees Hinkley Point's environmental impact. The EA is a non-departmental public body sponsored by the Department for Environment, Food and Rural Affairs (DEFRA) that regulates the disposal and discharge of radioactive waste, the discharges of cooling water, and the operation of standby generators, alongside other environmental matters such as surface waters and construction effluents (EA 2013).

4.2.3 Hinkley Point C (Proposed)

The first public inquiry about the construction of Hinkley Point C took place between 1988 and 1989. However, taking place at the same time as the 'dash for gas', and given unfavourable economics following the privatisation of the electricity sector, a new reactor was never constructed (Johnstone 2014). In the wake of these developments, the mid-1980s saw the establishment of the Stop Hinkley anti-nuclear campaign group, which was originally called Stop Hinkley Expansion, or SHE. The group emerged to fight against proposals for the new PWR known as Hinkley Point C and, according their literature, played a central role in opposing construction during the 14 month long public inquiry into the reactor. Following the abandonment of plans for the reactor in 1996, the group then formally changed its name to Stop Hinkley to reflect its new campaign role, advocating in favour of decommissioning the nuclear reactors on the Bristol Channel and Severn Estuary. Stop Hinkley is still active, and plays an on-going role in campaigning against the revised plans for a Hinkley Point C reactor, which are outlined below, advocating instead for renewable

energy and energy conservation (Stop Hinkley 2016). Stop Hinkley represent the NGO focus for this case study.

Despite the initial failure to develop a Hinkley Point C facility in the 1980s, the 2006 Government White Paper 'The Energy Challenge: Energy Review Report 2006' (DTI 2006) identified a move towards new nuclear and the concept of the facility was rekindled. Following the decision to proceed with nuclear power, a Strategic Site Assessment process was launched in 2008, leading to the identification of 11 potential areas for the new reactor, three on green-field sites and eight at the location of pre-existing facilities (Thomas 2016). During this process, Hinkley Point was put forward as a potential site by EDF, and following extensive consultation was selected in 2013 (EA 2013). EDF identified their rationale for the site selection as being that there has been a nuclear power station operating at Hinkley Point since 1965, and consequently that the local community is familiar with the technology and the employment opportunities it can offer (EDF 2009b). The initial public engagement around the facility has taken place both as consultations on a national basis and as localised consultations (Johnstone 2014). Taylor (2016: 166) notes that in contrast to the initial opposition against the facility in the 1980s, 'the prospect of a new nuclear power station attracted only muted criticism, mainly in respect of the construction works and new transmission cables. There is very little evidence, however, of opposition to the new nuclear station itself'.

Plans include the construction of two European Pressure Reactors (EPRs – also known as Evolutionary Power Reactors) and associated facilities, which were initially anticipated to come online by 2023 and would be operated by a multinational consortium led by EDF (EDF 2009a; Černoch and Zapletalová 2015). This reactor is the first of a new set of reactors, which, according to the UK Government, play a fundamental role in securing a low carbon, secure, and affordable energy future (DECC 2013). The preparations for Hinkley Point C began in 2014 (Černoch and

Zapletalová 2015), sparking debate about the necessity and environmental and social implications of nuclear power.

Following completion, which is contingent upon final financial investment, the expected electrical output of Hinkley Point C will be approximately 1630 MW per unit, giving a total site capacity of 3260 MW; equivalent to supplying approximately five million homes or approximately 7% of the UK's electricity generation capacity by 2025 (EDF 2009a; Černoch and Zapletalová 2015; Richards *et al.* 2013). However, the Hinkley Point C project has faced critiques, including, but not limited to, concern over state-aid inquiries, the formation of a finance consortium or lack thereof, loan guarantees, the collapse and refinancing of Areva, and reactor vessel design faults following issues in the construction of a sister facility – the Flamanville reactor in France (Thomas 2016). Nuttall and Earp (2014) add that further hindrances include the global financial crisis of 2008 and 2009 and the Fukushima Diiachi accident in Japan in 2011. Indeed, to date there is no indication of when construction may be completed.

Thomas (2016) provides an effective summary of the delayed developments around the most recent Hinkley Point C proposal. He develops his timeline by stating that in September 2010, EDF claimed it would make a Final Investment Decision on Hinkley Point C in 2011, with construction starting in 2013 and the first power entering the grid in 2017. However, following several rounds of delays, EDF then announced that while projected costs remained the same as 2013 estimates, the completion date was extended until 2025. By early 2016, the time at which this chapter was completed and Thomas' review was published, the contracts for Hinkley Point had still not been signed and EDF acknowledged that the 2025 target was probably unattainable (the contracts were finally signed on the 29th of September 2016). Heffron (2013) discusses the implications for this for UK energy policy, highlighting that taking into account the long planning permission process and construction periods required for new infrastructure, there is concern that the 20 GW of new

electricity generation capacity required over the next decade would not be met by nuclear power as planned. As a consequence, the developments at Hinkley Point C are accompanied by the critique that they may come too late to make a meaningful contribution to filling the impending energy gap.

4.3 Waste Storage, Disposal and Reprocessing, Sellafield Nuclear Complex

In tandem with nuclear energy production, the UK plays both a historic and an on-going role in nuclear waste storage and reprocessing, as a consequence of a nuclear legacy reaching back to 1950, and also on-going negotiations to find a suitable geological disposal site. Utilising approximately the same format as above, the following sections provide background information on the second of the two case studies: waste reprocessing, storage and disposal at the Sellafield Nuclear Complex, which has played a fundamental role in nuclear waste handling throughout this period. These sections use a temporal approach to exploring the evolution of the Sellafield site, illustrating the relevance of past, present and future energy justice discourses. These sections also introduce the predominant NGO, industry and policy organisations involved in the operation and oversight of the complex. However, as noted above the groups discussed do not denote an exhaustive list of the individuals and organisations represented in the research sample. Full details of this list are given in chapter 6, table 6.1.

Throughout its lifespan Sellafield has been the source of numerous controversies and accidents relating to radioactive environmental discharges and to workforce radiation exposure. As a result, it has been the centre of criticisms of alleged mismanagement and of insufficient/ineffective regulation. Further, questions have been raised around the poor understanding of its environmental impact and the economic rationale of the recycling option in nuclear fuel-cycle policy (Wynne 2013). Thus, in addition to the information outlined above, some of the most prominent

discourses and events are reflected upon below as a means of highlighting relevant energy justice concerns around the facility.

The range of radioactive waste materials present in the UK is more complex than in any other country due to the range of uses, number of different reactor structures, and ways in which radioactive materials have been treated throughout the UK's nuclear history (CoRWM 2006). Depending on its radioactivity level, this nuclear waste is reprocessed to make alternative fuels, or alternatively, can be stored, disposed of, or used for defence purposes. Both legacy and contemporary low, intermediate, and high-level nuclear waste from the UK are treated at Sellafield, which hosts processing and storage of these wastes alongside fuel manufacturing and recycling, and the decommissioning of ageing facilities (NDA 2013).

The Sellafield site on the West Cumbrian Coast of England is amongst the largest and most prominent nuclear waste facilities in the world, with facilities that span the entire history of the UK's civil nuclear industry (NAO 2012; NDA 2013). Figure 4.2 shows the location of the complex in relation to local towns and villages referenced in chapter 6. Extending over four km^2 in total, it is also one of the most complex nuclear sites globally, with over 1000 simultaneously operational facilities (NDA 2013). Historically, Sellafield – or Windscale as it was originally known – first existed for military purposes, and then secondly, as a commercially operative energy production facility. Today, approximately 95% of the UK's nuclear waste as measured by radioactivity is held at the facility (NAO 2012). Sections 4.3.1-4.3.3 give a brief history of the site's three main phases of development: (1) military plutonium production, (2) commercial energy production, and (3) waste storage and reprocessing, before section 4.3.4 introduces proposals for a Geological Disposal Facility (GDF). Because of the complexity of current operations, emphasis is placed on section 4.3.3 in this research. Finally, appendices 5 and 6 provide an overview of the site's management structure and timeline.

Figure 4.2 Location of Sellafield Complex

(Source: Sellafield Ltd)

4.3.1 Military Plutonium Production (1940-1951)

As briefly outlined in section 4.1.1 above, the weapons grade plutonium produced for the UK's nuclear programme and its associated atomic bomb was produced between three sites, Capenhurst, Springfields and Windscale, where the Sellafield site sits today. Capenhurst in Cheshire was responsible for uranium enrichment, Springfields in Lancashire for fuel manufacturing and Windscale for the production of plutonium through the reaction process (McNair 2013). Developed in 1947, simultaneously with the Graphite Low Energy Experiment Pile (GLEEP) at Harwell in Yorkshire, the Windscale Piles were Britain's first plutonium-producing infrastructure, and were owned and operated by the United Kingdom Atomic Energy Authority (UKAEA) (Davis 2009).

The two original reactors, also known as the Windscale Piles, came on line in 1950 and 1951 and were developed alongside a first generation reprocessing plant and the Pile Fuel Storage Pond, which was used to store, cool and prepare Windscale Pile Fuel for reprocessing. Following a fire caused by poor staff judgement and faulty instrumentation in Pile One in 1957, both reactors were permanently shut down on safety grounds, well in advance of their expected decommissioning date (Davis 2009; NDA 2011). The Windscale fire was the world's worst nuclear reactor accident before Chernobyl, and the most significant in British history as it led to the spread of radioactive iodine and caesium isotopes across the Cumbrian countryside (Wynne 2013; McNair 2013; Davis 2009). Wynne (2013: 288) comments further, that the fire and its environmental impact were 'surrounded by a great deal of secrecy', leading to later concerns over the transparency and openness of operations at the site. Davis (2009: 7) adds that 'the incident marked the end of the early euphoria that had accompanied the development of nuclear power in Britain'. This incident led to the creation of the Nuclear Installations Inspectorate, which oversaw the licensing of nuclear installations and insurance arrangements for all sites by 1959 (McNair 2013). Despite the incident, however, the area continued to play a central role in the British

Nuclear Weapons Program throughout the 1950s and 1960s as it sustained the handling and production of weapons-grade material (Davis 2009; Martiniussen 2003). Work on the decommissioning and clean up of the original Windscale Piles began in the early 1980s and continues today (NDA 2011).

This background highlights both a strong link at the Sellafield facility to a military past and, as a consequence of the Windscale Fires, consciousness of the potential for nuclear incidents. At the time this led to a surge in anti-nuclear campaigning, including the foundation of a local campaign group in 1980, Cumbrians Opposed to a Radioactive Environment (CORE). Over its history, the group has campaigned against the import of foreign nuclear waste into Sellafield, for the elimination of sea and air discharges at the site, in favour of just compensation for workers and members of the public suffering ill-health effects as a result of the processes at Sellafield, against all nuclear waste dumping, for lower radiation levels from all man-made sources, and for the cessation of nuclear power for both civil and military purposes (McSorley 1990). With their longstanding interest in campaigning against Sellafield and their overtly anti-nuclear commentary role, CORE represents the main NGO case study.

4.3.2 Commercial Energy Production (1956-2003)

As part of the realisation that nuclear reactors could both produce weapons grade plutonium and form the basis of electricity generation, the first reactors with dual military and electricity-generation roles were developed at Calder Hall in 1956 following the Magnox design (Davis 2009; NIA 2013; Bolton 2013). The Calder Hall facility was the world's first commercial power station and was followed by seven more prototype reactors, three more at Calder Hall and four at Chapelcross in Scotland (ONR 2013; NIA 2013). These initially dual-purpose plants – which plutonium-producing and commercial energy capacities – were later optimised for energy production only, with the role military plutonium production being returned to other Windscale facilities.

In the late 1950s the UK Atomic Energy Authority began its search for a successor to the Magnox programme. The Advanced Gas-cooled Reactor, or AGR, was identified (Davis 2009). Windscale was identified as the site to test the UK-specific design. The Windscale Advanced Gas-cooled Reactors (WAGR) were constructed between 1957 and 1961, operated successfully, and became the forerunner of 14 reactors of this design built throughout the UK using four different designs, with mixed results (Davis 2009). Following the closure of the WAGR facilities in 1981, decommissioning began in the mid-1980s (NDA 2011). Table 4.2 gives an overview of the lifespan of the commercially operative nuclear reactors at Sellafield.

The final closure of Calder Hall's fourth reactor in 2003 signalled the end of Sellafield's commercial energy role and a change in focus to fuel manufacturing and the storage and reprocessing of nuclear waste from both the UK and abroad (Martiniussen 2003).

Reactor	Reactor Type	Power	Operation Start	Closure
Windscale Pile 1	ACR	180 MWt	1951	1957
Windscale Pile 2	ACR	180 MWt	1951	1957
Calder Hall 1	GCR (Magnox)	50 MWe	1956	2003
Calder Hall 2	GCR (Magnox)	50 MWe	1956	2001
Calder Hall 3	GCR (Magnox)	50 MWe	1958	2001
Calder Hall 4	GCR (Magnox)	50 MWe	1958	2001
WAGR	AGR	36 MWe	1962	1981

(MWt = megawatt thermal effect, MWe = electrical power)

Table 4.2 Sellafield Reactor Overview

(Adapted from Martiniussen 2003)

Across this timespan, Sellafield continued to be a source of controversy. Wynne (2013) draws attention to two prominent events. Firstly, in the early 1980s the

Sellafield site was linked to excess childhood leukaemia clusters. This official inquiry into this occurrence was overseen by Sir Douglas Black, and subsequently became known as The Black Report. Despite the fact that the report was sceptical as to the cause of the increase in leukaemia incidence, the controversy continues today. Secondly, in 1984 Greenpeace accused Sellafield of radioactive discharges above the legal limit and the subsequent contamination of local beaches and water, for which Sellafield was later prosecuted. Wynne (2013) adds that despite heavy investment in public relations following these events, perceptions of the openness and honesty of the facility operators remained and remains, poor.

4.3.3 Waste Storage and Reprocessing (1964-Present)

Following the division of the UKAEA in 1971, control of Sellafield was given to British Nuclear Fuels Limited. However, since 2005 it has been owned by the Nuclear Decommissioning Authority (NDA) and operated by Sellafield Ltd (NAO 2015). Sellafield Ltd is the main industry group of this research sample. Sellafield Ltd holds and is responsible for site licenses at the Sellafield and Capenhurst sites. At Sellafield, their role includes responsibility for hosting fuel manufacturing and recycling alongside the processing and storage of low, intermediate and high level waste, and the decommissioning of ageing facilities (NDA 2013). Thus, Sellafield Ltd operates as a commercial body responsible for the safety of the Sellafield site. These three functions are explored below in turn. Today, Sellafield Ltd is the largest employer in the Cumbrian area with a workforce of approximately 5000, with a further 5000 contractual construction workers. Thus it is seen to play a domineering role in the local economic, social and cultural landscape (Wynne 2013). Sellafield Ltd operates under contract to the Nuclear Decommissioning Authority (NDA).

The Energy Act 2004 established the NDA, which was tasked with the decommissioning and clean up of the UK civil nuclear legacy (DECC 2016; McNair 2013). The NDA is a non-departmental arm's-length public body sponsored by the

DECC, the leading department for managing the use and disposal of radioactive waste in the UK (Sellafield Ltd 2012; HoC PCA 2013). The NDA is responsible for the decommissioning and clean up of the UK's 17 legacy sites, for which Sellafield accounts for approximately 75% of the total estimated lifetime costs (DECC 2016). In addition to partnership with the NDA, Sellafield Ltd also consults with the ONR, who regulate nuclear safety and licenses, and the Environment Agency, which oversees compliance with environmental regulations (NAO 2012). The ONR works with the NDA to optimise the safe decommissioning of its sites (ONR 2013).

Fuel manufacturing and recycling: As outlined in table 4.3, Sellafield currently holds one of the largest nuclear waste reprocessing facilities in the world. There are two nuclear-fuel reprocessing plants at Sellafield. The first, the Magnox Reprocessing Plant, handles Magnox fuel from Britain's early nuclear reactors, including the reactors at Calder Hall; the Magnox Reprocessing Facility came online in 1964. The second, the Thermal Oxide Reprocessing Plant (THORP) handles fuel from British AGRs, and LWRs around the world. THORP begun operation in 1994, and is the only oxide fuel reprocessing facility in the UK (NDA 2011). Within both, the reprocessing process recovers unused uranium and plutonium from spent reactor fuel, closing the fuel cycle and allowing the fuel to be reused in nuclear reactors (Martiniussen 2003). Through the process, 97% of spent fuel can be recycled to produce new fuel (96% uranium, 1% plutonium); the remainder of the output is nuclear waste (NDA 2011). The UK is one of few countries in the world with these capabilities, and reprocessed fuel from Sellafield is used internationally (NDA 2013). Reprocessing at THORP is due to end in 2018, following which some parts of the facility will begin decommissioning and others will be modified to allow interim storage of wastes from AGR reactors (Sellafield Ltd 2014).

		Tonnes per year	
LWR Fuel	France, La Hague	1700	
	UK, Sellafield (THORP)	600	
	Russia, Ozersk (Mayak)	400	
	Japan (Rokkasho)	800*	
	Total LWR (approx.)		3500
Other Nuclear Fuels	UK, Sellafield (Magnox)	1500	
	India (PHWR, 4 plants)	330	
	Japan, Tokai MOX	40	
	Total other (approx.)		1870
Total Civil Capacity			5370

*Now expected to start operation in 2016

Table 4.3 World Commercial Reprocessing Capacity

(Reproduced from WNA 2015)

Processing and storage of low, intermediate and high level wastes: The facilities at Sellafield store both legacy and contemporary wastes. There are four main legacy ponds and silos on the site, which were historically used to prepare fuel for reprocessing: the Pile Fuel Storage Pond, the First Generation Magnox Storage pond, the Magnox Swarf Storage Silos, and the Pile Fuel Cladding Silo. These units were not designed with decommissioning in mind, and over five decades have gradually deteriorated (NDA 2011). As a by-product of reprocessing in the Magnox and THORP facilities, high-level contemporary waste is also produced. At Sellafield, this waste is treated through vitrification, a process that allows the material to be stored safely in preparation for its eventual transportation and disposal (NDA 2011). The waste produced by these facilities sits alongside that already held in legacy storage ponds and silos, created throughout Sellafield's operation (NAO 2015).

Decommissioning: The National Audit Office (NAO 2015) criticises successive operators of the Sellafield site for not giving sufficient thought to the

decommissioning of facilities or the retrieval and disposal of radioactive waste throughout the facility's lifespan. Today, the site is characterised as extremely hazardous due to the historic build-up of contaminated buildings and untreated waste on the site, as well as the age of its facilities (NAO 2015). As a result, around 240 of the 1400 buildings on the site are either operating nuclear facilities or are legacy buildings housing radioactive material that 'are deteriorating or fall short of modern standards and pose significant risk to people and the environment' (NAO 2015: 4). The ponds and silos built during the 1950s and 1960s to store fuel for reprocessing operations and radioactive waste are reported as the most hazardous (NAO 2015). Sellafield Ltd anticipates having decommissioned and cleaned-up Sellafield by 2020. As of March 2014, the projected cost of this operation was nearly £48 billion after discounting future cash flows, an increase of £6 billion since March 2013. Clearing the site requires the transfer of all wastes into to a Low Level Repository and proposed Geological Disposal Facility, outlined in section 4.3.4 (NAO 2015).

4.3.4 Geological Disposal Facility Proposals (Present)

The waste currently housed at Sellafield is in interim storage (defined as up to 100 years), following which the plan is for long-term storage. According to Butler and Simmons (2013), the plans for the long-term management of higher-activity radioactive waste have been a contentious issue in the UK for over 30 years. Butler and Simmons outline that over this period the government policy has predominantly been for a geological disposal facility, but that successive attempts to carry out site investigations have provoked opposition from the communities nominated as potential host sites. Such a facility was initially projected to be online by 2040 (NAO 2012), but to date no host site has been identified and no infrastructural development has been undertaken, leading to uncertainty over the future of nuclear waste handling.

The last of these consultative processes to find a host community in 1997 was a failure, forcing the government to recognise the need for a different approach. According to Butler and Simmons (2013), this created the opportunity for the consideration of ethical issues in the disposal of nuclear waste. This later became a core focus of the Committee on Radioactive Waste Management (CoRWM), which was established in 2003 with the remit of evaluating options for the long-term management of waste and advising government. Today, the UK Government's Managing Radioactive Waste Safety (MRWS) policy sets out an approach to implement the geological disposal of higher activity nuclear wastes (Miller 2015). Within that policy all wastes, excluding those from Scotland, are to be placed underground in geological disposal facilities, sited and developed in partnership with a willing UK community. In contrast, Scotland's policy is for long-term management in near-surface facilities (DECC 2013). A volunteer process is currently on-going, with a view to identifying a host community sited within any of the potential rock types and suitable geological environments in the UK. The Government intends that waste should be stored in safe and secure interim storage facilities prior to a geological facility becoming available.

4.4 Conclusion

This chapter has provided background information on nuclear energy in the UK and the two case studies of this research: energy production at the Hinkley Point Nuclear Complex in Somerset, and waste storage, disposal and reprocessing at the Sellafield Nuclear Complex in Cumbria. It explored the evolution of nuclear politics and provided site-specific details, illustrating throughout that this background permits insights into past, present and future energy justice discourses. Within this broad remit, it also introduced the potential energy justice concerns around each facility on the basis of events and current discourses. Finally, it has provided a brief introduction to the core NGO, industry and policy groups around each of the two case-study facilities, who, given their role as the predominant stakeholders in the

operation and oversight of each case facility, represented the target sample for this research. It did caution, however, that because of the snowballing approach taken to participant sampling the stakeholders introduced did not provide an exhaustive account of the individuals and organisations represented in the research sample, which, instead, are introduced in table 5.1 and 6.1 in the corresponding chapters. In summary and in closing, this chapter provided context to the results and discussion that follow.

Chapter 5: Energy Production: Hinkley Point, United Kingdom Results

This chapter provides an overview of the energy justice themes emerging from the semi-structured interview data around the first of two case studies, energy production at the Hinkley Point Nuclear Complex in the UK. As outlined in chapter 4, this includes the discourses around the currently operative Hinkley Point B station as well as considering the government's proposed new reactor at the site, Hinkley Point C. Results are presented throughout section 5.1 according to the three tenets of energy justice: distributional justice, justice as recognition, and procedural justice. In outlining the energy justice discourses around Hinkley Point it addresses the overall research question of this thesis – 'how do elite actors within the nuclear energy system articulate energy justice?' – from an energy production perspective. Throughout, attention is paid to the analytical themes of time, systems component and actor. This approach allows comparability across the responses garnered from each of the research groups sampled: 16 NGO respondents and 21 policy respondents[3]. Section 5.2 then draws together common themes emerging from the results and presents them in table format as a means of contrasting them to the second case study, waste storage, disposal and reprocessing at Sellafield in the UK. Given that developments at Hinkley Point C are changing on a daily basis, this analysis takes a cut-off point of the 1st of January 2016, after which no further empirical investigations were undertaken.

5.1 Articulations of Energy Justice: Hinkley Point Nuclear Complex

The themes presented throughout this results chapter were derived from both top-down coding based on the research questions and literature, and bottom-up coding emergent from the interview transcripts. During the first phase of top-down coding using NVivo, excerpts, quotations and passages were coded into themes designed to

[3] The term 'policy' or 'policy organisations' is used throughout for simplicity's sake. This group contains policy as well as industry representatives and academic experts, as discussed in section 3.4.

mirror the interview question framework, focussing on distributional justice, justice as recognition and procedural justice. Following explorations of similarities and differences between the emergent codes, new group codes were then created that captured the meanings of information within them. This bottom-up process allowed identification of new details from the interviews. Overall, the analytic approach to the data analysis not only allowed for in-depth exploration of the texts, but of comparisons between the three variables of investigation: time, systems component and actor. This process is outlined in full in section 3.5. In all sections the results are presented firstly from NGO respondents and secondly from policy respondents in order to highlight contrasts between their given perspectives.

During the interviews the respondents requested varying degrees of anonymity, which are outlined in table 5.1 overleaf. Where participants requested full anonymity, their names, positions and organisations have been removed and the attributions randomised.

Name	Position	Organisation
NGO		
Allan Jeffrey	Assistant Co-Coordinator	Stop Hinkley
Josephine Smolton	Member	Stop Hinkley
Sue Aubrey	Coordinating Team Member	Stop Hinkley
Roy Pumfrey	Spokesperson	Stop Hinkley
Pete Roche	Press Officer	Stop Hinkley/No 2 Nuclear Power
Nichola Clark	Member	South West Against Nuclear
Rowland Dye	Steering Group Member	South West Against Nuclear
Eurig Scandrett	Chair	Friends of the Earth Scotland
Pete Wilkinson	Director	Wilkinson Environmental Consulting Ltd
Regan Scott	National Secretary Research and European Coordination	UNITE, formerly TGWU
Policy		
Andy Blowers	Emeritus Professor	Open University
David Elliott	Professor	Open University
Steve Thomas	Professor of Energy Policy	University of Greenwich
David Sigsworth	-	-
Doug Bamsey	Corporate Director	Sedgemoor District Council
Joel Kenrick	Special Adviser	DECC
Jude Maxwell	Sustainability Specialist	Scottish Enterprise
Robert Armour	Chairman	Smarter Grid Solutions Ltd
Hergen Haye	-	-
Oliver Epsom	Lead Mechanical Engineer	APL
Rep One	-	Energy Company One
Rep Two	-	Energy Company One
Rep Three	-	Energy Company One
Rep Four	Head of Sustainability, Generation	Energy Company One
Niall Riddell	-	-
Robert Birkenhead	-	-

Table 5.1 Summary of Hinkley Point Site Interview Participants

5.1.1 Distributional Justice

Across the two case studies, the Hinkley Point Nuclear Complex and the Sellafield Nuclear Complex, 12 distributional themes emerged from the interview discussions. For Hinkley Point, these included six primary topics: disruption during infrastructure development; radioactive contamination; health and safety; jobs and economic prosperity; education; and cost. Each of these themes is discussed here. These themes represent common threads of discussion and topics of concern as raised by the interview participants, and were identified via the coding process outlined above. The extent and form of these concerns varied according to the time, systems component and actor in question. These differences are explored in the following paragraphs.

Within the emergent articulations of energy justice it was possible to identify, most prominently, differences in the framing of energy justice according to the actor in question. Broadly speaking, NGO respondents focussed on occurrences of 'injustices', points at which the site was perceived as negatively affecting the local area, whereas policy groups focused positively on the provision of 'justice' in terms of local benefits. Within this framework, NGOs were typically understood to be the recipients of just or unjust practices, and policy groups as the providers. These contrasts are illustrated below. Where policy respondents cited negative distributional concerns they were in relation to the potential disruption caused by site developments and were characterised by an attitude of reluctant acceptance.

5.1.1.1 NGO Distributional Justice Articulations

Outside of the recognised benefit of job provision, NGO respondents reported largely negative attitudes to the Hinkley Point Complex around four of the aforementioned themes: (1) disruption during infrastructure development, (2) radioactive contamination, (3) health and safety, and (4) cost. The discourses presented

primarily focus on the B and C stations at Hinkley Point, with only passing reference to the Hinkley Point A station, which is currently undergoing decommissioning.

On the first theme, disruption during infrastructure development, all NGO respondents referenced the on-going construction works at Hinkley Point C. Pete Roche, Press Officer for the anti-nuclear campaign groups Stop Hinkley and No 2 Nuclear, emphasised the impacts of lorry traffic on local villages, the influx of workers, and local biodiversity impacts, such as badgers being cleared from the site. Further, all NGO respondents highlighted the site's impact on housing development and rent prices, transport, urban renewal, and bypass provision (this primarily included concern over local road infrastructure given that access to the site is along C-class roads), and the disruption to housing stock caused by the Cannington Bypass developments.

Roy Pumfrey, a spokesperson for the campaign group Stop Hinkley, remarked that proposals for a bypass around Bridgwater during the 1988 Hinkley Point C inquiry were excluded from EDF's plans for the new reactor development, and that consequently traffic continued to use minor roads. He reflected on this as an unpopular decision, given the town's narrow streets and the high frequency of construction vehicles. Allan Jeffrey, Assistant Co-ordinator of Stop Hinkley, reinforced his sentiments as he highlighted that local residents had 'remembered from Mrs Thatcher's inquiry that the inspector had said … that there should be a road that went from the northern junction to 23 right across the river and straight up to Hinkley'. Without its provision, he perceived road access to be a primary topic of concern for local residents as the A39, the remaining access route to the complex, was full of tourists, farm workers and hundreds of pieces of machinery, causing gridlock. Allan added that as a consequence of these developments, 'various groups formed at Cannington and the villages by the motorway, including Combwich. They were making a fuss about the traffic gridlock because they could see it already – ten years of big problems on the roads over the building timescale'. He continued that

eventually, 70% of the weight of materials for the facility will come by sea, but that that can only take place when the jetty at Hinkley Point comes into being, which is a long way off.

For Allan Jeffrey, who reflected on disruption during the development stage of Hinkley Point C at length, one of the primary issues was the process of site preparation. Allan explained that before EDF were given planning permission for the developments, and despite the fact that 'there were lots of committees, and planning things and financial things which meant that it may never be built, they were going to tear up the land, and that is what they did'. Allan explained that EDF and its associated contractors cut down trees and hedges and cleared significant areas of archaeological finds as part of the site foundations before the station had been given the go-ahead. Allan expressed both frustrations at the impacts of the developments on local flora and fauna, and, as is explored in more depth in section 5.1.3, the order of the development process. The example of concerns over the negatively perceived impacts of road infrastructure and site clearing illustrates that NGO discourses were not always explicitly anti-nuclear or exclusively directed at the burdens or benefits of the Hinkley Point facility itself. Instead, they also manifested as concerns over its associated developments, highlighting a more benign edge to their energy justice concerns. This finding was taken to represent a degree of 'non-nuclearity', the detachment of energy justice discourses from energy production – a concept considered further in section 7.1 of the discussion.

Returning to more classical critiques of nuclear facilities and to considerations of the Hinkley Point B facility, six respondents raised concerns about the potential for radioactive contamination and health and safety, the second and third distributional justice themes. Sue Aubrey, a coordinating team member for Stop Hinkley, expressed dissatisfaction over the monitoring of health at the local level as a consequence of the potential radioactive impact of the facility. She stated that 'I think they feel frightened and a bit intimidated in discovering this, because they have to do

something about it'. Sue Aubrey went on to give the example of the apparent failure to investigate the high occurrence of Down's syndrome babies around Windscale in Cumbria following the 1957 Windscale Pile fires, expressing concern that the same would happen at Hinkley Point. Throughout such discussions, Sue Aubrey framed the government's approach to nuclear energy as short-term, stating 'it is almost as if they are not worried about the future'. Thus, she demonstrated that in her opinion, the two themes – radioactive contamination and health and safety – were intimately linked, and highlighted perceived reluctance from policy bodies to engage with the issue. Nichola Clark from the group South West Against Nuclear (SWAN) agreed, stating that no matter what the source of nuclear material is, whether it is energy provision or nuclear weapons, the ultimate concern is for their radioactive influence on health and the environment; 'the issue always comes back to being the same, and that is that the stuff when it comes into contact with us is deadly'.

Also speaking to issues of health and safety, Allan Jeffrey recalled an accident at the Hinkley Point B facility where a bolt came loose and broke a hole in one of the pipes, causing radioactive material to leak out. He explained that this was the first time local communities were asked to use iodine tablets, which inhibit the uptake of radioactive iodine into the thyroid gland. He added that there have been various other incidents, which have been covered up. The potential radioactive impact of nuclear energy was a motivation for fellow Stop Hinkley member Roy Pumfrey to join the local NGO as he had watched the impacts of the Chernobyl disaster, which included Welsh farmers having to have their sheep tested before they could sell them into the food chain. Throughout the interviews these concerns for the radioactive burden of the site manifested not only as distributional concerns – the unequal distribution of radioactive risk – but as justice as recognition concerns, as described in section 5.1.2.

Developing the theme of health and safety further, Nichola Clark went on to state that there are insufficient plans for what happens at Hinkley Point should the

reactors stop producing electricity. Nichola gave her opinion that we are living in a world where the majority of scientists, climate scientists, and people that know about the finiteness of resources subscribe to the concept of Peak Oil, and yet, she stated that 'EDF have designed emergency diesel generators to be running in 60 years time. It is an interesting concept that that is going to be how we are going to be keeping things cool…they are certainly not thinking long term, I do not think'. Her concerns illustrated the possibility of evolving energy justice concerns through time.

Nichola Clark believed that the military past of nuclear energy was the driver of its continuation as a civilian energy source and as a result, the reason we faced the hazards of nuclear power and the volatility of energy supply:

> *'It is the ultimate threat, is it not? It is the ultimate weapon, it is a thing you can threaten your neighbour with in a way that no other weapon can. It is a nice little exclusive club where only a few countries are allowed to have any. That, at the macro-level, is what drives it; all of that dark shadowy world of money and power … is what drives it. There is no mistake that there is uranium 236 from so called power facilities in parts of the Middle East where they have dropped loads of bombs'.*

Nichola recalled that throughout the early 1980s, when she was a child, there was a prevalent societal fear of the nuclear bomb, which permeated the mainstream songs of the day. In light of these statements, Nichola went on to summarise her objections to Hinkley Point (as well as nuclear more generally) as 'the unholy trinity', the fact that (1) nuclear contamination is invisible, (2) the industry is secretive and known for its secrecy so they do not want you to talk about it, and (3) our unwillingness to grapple with complex issues. She closed, 'those three things they work together. Those are the things as a campaigner you have to try and break through'.

Finally, four NGO respondents went on to highlight dissatisfaction with nuclear subsidies, raising the theme of cost. The financing of the new Hinkley Point C project raised concerns about the perceived maldistribution of financial subsidies, including tax money gained from the general populous. In this regard these critiques moved past local-level concern to consider the financing of nuclear power as a national distributional burden. Regan Scott of UNITE and formerly The Transport and General Workers' Union (TGWU), reflected that if private companies did not meet the costs for the new Hinkley Point C facility, the money for it would come from the 'public purse'. This is not where she perceived the burden should lie. Roy Pumfrey extended this case as he explained that at the first meeting in Cannington to discuss plans for Hinkley Point C, the construction price was estimated at £8 billion, but later increased to £12 billion, and, at the time of his interview, £24 billion. Thus, Roy summarised his objection to nuclear to three main points (1) the existence of renewable energy alternatives, (2) the fact that the new Hinkley Point C is an untried and untested reactor design, and (3) that in his view, it is so expensive, especially given the high guaranteed strike price for energy from Hinkley Point C. Further, Allan Jeffrey explained that EDF know delays mean money, and that each month or year that the process is held back means millions and millions of pounds lost. He continued:

> '*At the moment EDF are in financial dire straights. France has got to find that money, it is not up to our politicians. It is a French plant being built with French technology and they are the people that have got to pay the money. The deal that the government has signed is very, very bad for English citizens and businesses, because if it ever does get built eventually – which might be in ten or fifty years time – we will be paying for the most expensive electricity in the world. By that time any rate renewables will probably made centralised power stations redundant'.*

Speaking to the same topics, Pete Wilkinson, Director of Wilkinson Environmental Consulting Ltd expressed frustration not only over the costs and validity of the nuclear case, but also over the stalled developments at Hinkley Point C:

> *'Hinkley C still has not gotten any planning permission. There is nothing signed or sealed about Hinkley C... so the whole thing is built on a bed of sand it seems to me. It is smoke and mirrors to convince people that this is the best deal around. We have got to go for it. It is going to give you lots of jobs. It is going to keep the lights on. The whole thing is just a propaganda exercise if you ask me. Well the energy security issue has been out the window for a long time because it is not going to keep the lights on at all, because they will not be turning 1 KW of nuclear energy for decades yet. Probably 2025 might be the first time that Hinkley C turns 1 KW of nuclear generated electricity'.*

In a similar vein, Roy Pumfrey went on to question the contribution of nuclear energy in the UK's energy mix in general, questioning not only the viability of the project, but also the government's perceived disregard of the potential dangers of nuclear power, including the leukaemia and cancers referenced above.

However, despite the broad critiques and concerns outlined above, Sue Aubrey stated that as the A and B stations have been in operation for so long without any obvious accidents, and because the Hinkley C discussions have been going on since the late 1980s, the local populous has become somewhat blasé towards the complex. Roy Pumfrey shared her sentiments, adding that 'I think there are people who are concerned about nuclear power but you know, they have sat here in the shadow of a nuclear power station for a long time'. Roy went on to state that local support for the station existed because people have worked at, are retired from, or have family that work at the Hinkley Point A or B stations. Given this was the case, the Stop Hinkley ground had experienced limited uptake for their anti-nuclear campaigns as, according to Sue Aubrey, 'in the local community people are so

desperate for jobs that they are not going to listen to it. Generations of workers are all right, so why worry about this?'. In this regard, Sue and Roy represented their views towards the site as being in a minority and stated that as the facilities have presented no perceptible risks, the majority of the local population tolerates their presence.

5.1.1.2 Policy Distributional Justice Articulations

Generally speaking, policy framings of distributional justice focused positively on the provision of 'justice' in terms of local benefits in relation to two key themes, (1) jobs and economic prosperity, and (2) education. This includes new infrastructure created as part of the Hinkley Point C site. In this regard, the policy discourses surrounding distributional justice were concerned with the provision of 'environmental benefits' rather than 'environmental ills', in contrast to the NGO discourses presented above. Where negative attitudes were presented they were in recognition of potential disruption caused by site developments and the issue of cost, and were characterised by an attitude of reluctant acceptance. Policy respondents also spoke to their understanding of the views of others, referencing 'local' acceptance of the facilities in contrast to 'regional' scepticism, suggesting a geographical distribution of justice as recognition concerns. Illustrative examples are presented throughout the following paragraphs.

Firstly, all policy respondents referenced the positive impact the Hinkley Point Nuclear Complex had on the local job market, and consequently the local economy. The stability of the job opportunities provided by the current A and B and proposed C stations was seen by Representative One from Energy Company One as a positive input into what he characterised as relatively deprived local areas affected by the recent closure of a number of medium-scale industrial facilities, including the cellophane factory on the outskirts of Bridgwater. He added too that the economic benefits of the facility extended beyond job opportunities at the sites themselves to

knock-on employment opportunities in the surrounding area, including rental accommodation for contractors and restaurant provision. This included positive accounts of job provision following the announcement that the initial phase of development for Hinkley Point C was going to begin. Representative One explained that the station had received requests from local hoteliers asking to be included on their accommodation list for workers, adding that these opportunities were long-term in nature given that the Hinkley Point Complex has been in operation for 40 years and, with the assumed completion of Hinkley Point C, is set to operate until 2060 or longer. With such opportunities in mind, two policy respondents used positive discourses to characterise local opinions and impacts:

> *'Now, these communities want a nuclear power station, they know this is their lifeline in terms of economic growth and sustaining the economy'* (Hergen Haye, Unaffiliated)

> *'… A lot of local communities really want nuclear on board because they want the jobs and they want the development in potentially under-invested parts of the country. So, you know, if you look at Somerset where we are building Hinkley Point C, it is actually quite a deprived area and bringing jobs and skills there is going to be a massive thing for them. The key there is obviously the construction – it is building a transferable skill…'* (Representative Four, Energy Company One)

In this context, the siting of the proposed Hinkley Point C station was taken to be contingent upon the social acceptance of the pre-existing Hinkley Point A and B facilities:

> *'In nuclear terms, we have identified all the communities that already have nuclear power – have had it for the last 40 years – and broadly speaking (there are always pockets) but broadly speaking, these communities want nuclear power stations to be built'* (Hergen Haye, Unaffiliated)

Alongside job provision, three anonymous respondents from Energy Company One, Representative One, Representative Two and Representative Three, highlighted the role of the Hinkley Point Complex around the second theme, education provision. This included engagement with the Cannington College in Bridgwater and visits to primary schools, including Millerton School near Taunton, which is a member of the eco-schools scheme. For Representative Two, such engagement provided an opportunity to inform school children, and as a consequence take some of the 'mystery' out of nuclear energy. He believed this was ever more important since 9/11, which led to the belief that you had to close all visitor centres on safety grounds, which in turn has led to nuclear becoming a lot more mysterious. Representative One highlighted a desire to go further with their input, including vocational courses for people who might want to work at the station or to work for related contractors.

These discourses are taken to highlight two key points of interest; firstly, they demonstrate the ripple effect of the production of nuclear energy in terms of its associated impacts. As reiteration of the above, for example, Doug Bamsey, Corporate Director of Sedgemoor District Council, highlighted that when working with the leading energy company the priority for local negotiation primarily concerned the mitigation of associated impacts, including incoming populations, increasing life opportunities, training and skills, housing development and associated rent increases, transport, and urban renewal. In this regard, Hinkley Point was perceived as a facility with far-reaching local socio-economic impacts. Secondly, these results demonstrated the relatively benign character of concerns; contrary to typical concerns around nuclear energy and despite the contributions of anti-nuclear respondents, discussions did not typically revolve around critiques of nuclear itself. This illustrates differences in energy justice framings according to the third variable of investigation, actor.

Alongside the reported benefits, however, policy respondents also acknowledged the negative effects of infrastructural development at the Hinkley Point C facility. Yet, in contrast to the NGO perspectives presented above, these were considered necessary and as such were characterised by an attitude of reluctant acceptance. Hergen Haye stated, for example:

> *'Does everyone want seven or eight years of disruption in terms of building these things? Obviously not. These are very, very large installations and there will be inevitably some in the community who will be affected; their homes may have to be bought off them, some will have to move away, some will choose to move away, and that is hard for someone who bought their retirement home there, thinking they live in the beautiful countryside of Shurton in Somerset and all of a sudden there are three lorries a minute passing by their front door. That is regrettable, but unfortunately it is not possible to build a nuclear power station without that disruption, so you have to work with them to find the least disruptive way of doing it'.*

Policy discourses also highlighted the scalar complexity of energy justice articulations as, in drawing on experiences of attitudes to nuclear energy from further afield, three interviewees highlighted scalar differences in the perceived health and safety impacts of nuclear energy. Robert Birkenhead, an unattributed respondent, stated to this end that:

> *'The county council of Somerset, they are all for Hinkley Point C, our local MPs are all for Hinkley Point C, but it seems the further you go away… they are anti-nuclear because they are scared, they think the nuclear power station is going to blow up and they are all going to have to be evacuated… They only understand the risks'.*

Robert Birkenhead went on to link such attitudes to the weapons-based past of nuclear energy, stating that it is an 'unfortunate legacy of the industry and some people still think that Hinkley Point is going to explode like a bomb'. Robert continued that 'the local people are more worried about the disruption, nationally they are more worried about nuclear power and what happened about Chernobyl and what happened at Fukushima, and the whole debate'. Representative Three from Energy Company One seconded his view:

> *'With a nuclear power station… those who live closest to it know most about it and those used to it are least opposed to new build, and then as you get further out that relationship is not as strong. The knowledge is not as strong, and the fears … grow the further away you are from it'.*

> *'I think there are differences, we have actually seen a change depending on how close you are to the site and as you get towards even Bridgewater actually. You get more of the national perspective and the national perspective tends to be more about the broader and longer-term issues, so more about energy security and national issues, concerns about what are we going to do with radioactive waste come out in a different way in that people are thinking on a national basis, whereas close in to the site it tends to be about the direct impacts of the power station. And it is surprising, you do not have to go that far from the site to get to that national average picture, if you like'.*

Outside of this reference, the role of nuclear energy internationally and the idea of energy justice having international impacts was only mentioned in passing, demonstrating a focus from all but two policy respondents towards its local and national manifestations. Where mentioned, Doug Bamsey highlighted inattention to international concerns stating, by way of an example, that 'uranium mining is never really considered as an issue and if it is, the anti-nuclear lobby only raises it'. International considerations were raised by Hergen Haye as a reflection on the role

of nuclear energy in matters of energy security and international business, including work with French or Chinese companies to explore differing community integration programmes or finance options for Hinkley Point C. Speaking in terms of energy security, Hergen stated that:

> *'Whenever we look at policies for energy generation we also look at what fuel is necessary and what are the implications for accessing that fuel. So, across "the company" (name substituted for anonymity purposes) we have numerous debates – is it really worthwhile to solely be dependent on fossil fuels from abroad? It is an energy security issue. So we do look at uranium mining in Canada, Africa, Australia, because it is a relatively secure source of fuel'.*

These results highlight the scalar tension between what both NGO and policy respondents described as local, generally ambivalent attitudes to nuclear energy, and regional, more sceptical perceptions of the nuclear facilities, including both safety and health fears. They also demonstrate a focus on national or local-scale issues. Such discussions typically revolved around the scale of the complex's potential impacts, both in terms of infrastructure and the impacts of the facility in case of an incident. These manifestations were understood to be the outcome of the perceived distribution of benefits and the range of their impacts.

Finally, in keeping with NGO discourses, policy respondents also shared concerns over the price of new nuclear energy at Hinkley Point C, suggesting an alignment of concerns and shared interest in a 'fair' price for energy supply. David Sigsworth, an unaffiliated respondent, stated that Chinese and French investment in the new Hinkley Point nuclear station is giving rise to 'a belief by several leading commentators that there is a substantial amount of overpayment for the contract and that is going to result in loading more costs into UK energy bills… because the Westminster government plans that those costs will pass as a surcharge or a levy

into customer's bills'. David believed that this would increase the prevalence of fuel poverty in the UK.

5.1.1.3 Summary of Distributional Articulations

Alongside a high level of evaluative detail, the results above provide two main insights into distributive energy justice in practice as they relate to the Hinkley Point Nuclear Complex. Each of these findings is briefly reinforced here. Firstly, the results revealed that articulations of distributional justice do not just focus on the nuclear facility itself, instead manifesting as concerns over its associated developments, including local road infrastructure and the necessity of recognising 'non-nuclear' concerns. Secondly, the results demonstrate both variation and consistency in the distributional justice articulations according to actor in question, thus moving past typical pro-nuclear and anti-nuclear divides. This primarily emerged as united concerns over the costs of new nuclear power. Thus, in the case of policy respondents, they demonstrate attention to 'non-nuclear', the promotion of jobs and economic development and education, and more negatively perceived nuclear elements in terms of financial affordability. A summary of the distributional justice themes is provided in table 5.2.

NGO	**Policy**
• Disruption during infrastructure development • Radioactive contamination • Health and safety • Cost	• Jobs and economic prosperity • Education • Disruption during infrastructure development • Cost

Table 5.2 Summary of Distributional Results by Sample Group

5.1.2 Justice as Recognition

Across the two case studies, the Hinkley Point Nuclear Complex and the Sellafield Nuclear Complex, 13 justice as recognition themes emerged from the interview discussions. In the Hinkley Point case, this included concern for those at risk of potential health impacts, local communities that were unaware of developments at the complex, international actors that were not represented in decision-making processes, future generations, the electricity consumer, youth, and the local community within a defined impact zone. Each of these groups is discussed here. Across the two sample groups the results show that NGOs were primarily concerned with those negatively affected by the facility, whereas policy groups focused on those that would gain from it. Policy groups did, however, question the scalar extent of benefits from the site, again moving past assumed pro- and anti-nuclear stances. These findings are explored in the following paragraphs.

In addition, the results of the interviews gave insight into the questions of not only 'justice for whom?' but also 'justice *by* whom?'. In this regard, the respondents highlighted who is perceived to be responsible for remediating injustices, or conversely, ensuring the continuation of just practices. Across the two sample groups, NGO and policy, there was recognition that although all actors play some role in the provision of energy justice, industry and policy bodies carry the majority of the responsibility. In discussing this idea of accountability, the respondents advanced the typical application of justice as recognition, which, generally speaking, has focused on the recipient of benefits or ills only, not those who create them – an aspect of justice that is very pronounced in climate justice debates. Illustrative examples are provided in the following paragraphs. Throughout, the results are presented firstly from NGO respondents and secondly from policy respondents in order to highlight contrast between their given perspectives.

5.1.2.1 Justice for Whom?

In the discourses gathered from the ten NGO respondents sampled for this case study, justice as recognition discourses reflected four key groups, (1) those at risk of potential health impacts, (2) international actors that were not represented in decision-making processes, (3) women, and (4) future generations. Despite the acknowledgement of some benefits gained from the site, these discourses were predominantly framed with attention to 'injustices', the negative impacts of the facility on the aforementioned social groups.

Both Sue Aubrey and Allan Jeffrey began by recognised that the Hinkley Point Complex was a good source of employment in an area where no other industry was particularly stable. However, they also identified concern for those at risk of potential health impacts. Primarily, this concerned workers at the facility who faced a greater risk of exposure to radioactive contamination, thereby recasting the provision of jobs in a negative light. Adding to this theme, a respondent who will remain anonymous due to the sensitivity of the information, gave an example of a family in their local village that had a child with Down's Syndrome around 25 or 30 years ago and later lost the father to leukaemia, both health impacts which they attributed to the facility:

> *'The father of these children worked at Hinkley and he got leukaemia and died pretty quickly, and his wife would not ever talk about it at all. It was a closed book for her to talk about the dangers. She also gets a very good pension as I understand'.*

Continuing this theme, Nichola Clark from the group South West Against Nuclear (SWAN) stated that 'we are messing around with things and making things that have the potential to mess up the DNA of everything. I fail to see how we are ever going to contain it and stop it from doing that'. Further highlighting the perceived risks of the

site, Allan Jeffrey expressed concern that workers were accidentally exposed to radiation doses, and explained that local communities were asked to carry iodine tablets in case of emergency; a necessity he perceived they should not face.

Alongside concern for those facing potential health impacts, three NGO respondents also stressed responsibility to international actors who they perceived to be absent from decision-making processes. Thus, they did so in a normative capacity, arguing that international actors *ought* to be included as part of a just system. This included the need to recognise those in uranium mining areas in terms of their rights to energy justice, and to recognise the potential health impacts of international disaster and radioactive contamination on a globalised scale. Josephine Smolton, a member of Stop Hinkley, stated to this end that approaches to nuclear energy in the UK were too narrow and did not take into account the full life cycle implications of the technology:

> *'When it comes to something that you are creating that affects the planet, the whole planet needs to be around that table, not a government. It is not one government's decision; it is unethical to make decisions in one country that are going to affect people around the world'.*

She added that in terms of decision-making 'it is on an individual level, it is on a country level and I am afraid it will be on a global level at some point. With Fukushima there will be a crisis and globally we will have to come together at that point'. In this case, Josephine perceived that the only situation during which she could get the international focus she advocated for came as the outcome of a nuclear disaster.

Roy Pumfrey agreed that whilst nuclear power arguably does something for global warming, it also requires uranium mining, 'which is a particularly unpleasant affair'. Nichola Clark noted that when you talk to people about uranium mining, most people

do not know anything about it, 'and they certainly do not know anything about the plight of communities that do live with uranium mining'. She continued, 'if we had to live with uranium mining next to us as well as the power station fairly close by then people's attitudes might be a little different'. Adding a different edge to international concerns, Sue Aubrey later reflected on the ethics of proposed Chinese investment into Hinkley Point C given what she perceived to be the country's poor safety and human rights record. Across these discourses, then, the NGO respondents gave attention to international, whole-systems approaches to energy justice, recognising not only the implications of the process in the UK, but abroad.

Nichola Clark went on to highlight the issue of gender as she revealed perceived inattention to the role of women in the nuclear industry – the third justice as recognition theme. Nichola explained that during her time with Stop Hinkley, which preceded her work with SWAN, herself and a colleague presented a report to the DECC NGO Forum on nuclear new build on gender issues. The report questioned the role of women in the nuclear industry, decision-making and politics. Within, she highlighted a gender bias, where in her view women suffer most of the radiological burden of nuclear power despite it being a male-dominated industry with male-dominated decision-making. Nichola stated that gender is dealt with as a minority issue alongside ethnic minorities and sexual minorities, but that 'we are not a minority, we are 50% of the population'. She recalled that following the report there was an increase in mentions of women in the nuclear industry, meaning that 'someone sat up and paid attention'. However, she was dissatisfied with this result as their response appeared to say '"well, we will just recruit more women into the industry", and that does not really address the fundamentals of gender issues, it is far more fuzzy and complicated than they would have it'.

Nichola later went on liken the neglect of women issues to environmental racism and institutional racism, which she believed could be seen across the UK as, in her opinion, energy infrastructures are disproportionately sited next to marginalised and

poorer communities. She gave the example that in the Somerset community – especially at the time when reactors were first constructed – it was an economically marginal area which she suspected would have lower than average rates of literacy because of its farming roots. Thus, for Nichola, the siting of nuclear facilities is 'an issue of poverty and class on some levels'.

Finally, NGO respondents also reflected on the necessity of recognising future generations. To this end, Josephine Smolton commented that her definition of energy justice would include 'the right of all the people that are coming on the planet after us'. She added, 'and that is where the abomination is, because the decisions being made now are not respecting the rights of the people that are going to be living on this planet'.

In contrast to the often trans-boundary and inter-generational focus of NGO respondents, policy respondents focused most notably on local and national level actors, including (1) the electricity consumer, (2) youth, (3) workers, and (4) the local community within a defined impact zone.

Speaking to the first theme, the electricity consumer, Representative Four from Energy Company One stated that their responsibility ultimately lay with the electricity purchaser:

> *'It is for the general public; that is your major stakeholder. Your customer who ultimately needs the energy is who you are ultimately providing for, be it a business customer or a household customer...'.*

The consumer, in this instance, was framed as a national collective. On the whole, however, policy respondent discourses primarily recognised groups at the local level and manifested as both recognition of those that are currently represented in developments and those that are not, introducing evaluative and normative

statements. For Representative One from Energy Company One, this included the necessity of engaging with local authorities, parish councils, and the public. More specifically however, Representative Three from Energy Company One perceived the planned construction of Hinkley Point C to be a positive opportunity for youth groups, the second policy category. Representative three explained that as a result of their focus on youth, their company had visited local colleges and schools, established youth forums, and developed school competitions. Doug Bamsey from Sedgemoor District Council, who also focused on youth as an area of priority, explained that this indirectly represented a concern for future generations as the children in that are in the education system at the moment could gain employment in the new Hinkley Point C facility after the ten-year construction phase. Robert Birkenhead also recognised that particular groups would benefit, including the youth that will gain employment and the local businesses that will benefit from increasing trade. This came alongside the UK public, who he believed would gain from a low-carbon, secure supply of electricity. In this instance, justice as recognition emerged as expressions of who *is* included in the operations at Hinkley Point Complex, or as the benefits they present.

In keeping with NGO discourses and in addition to considering who is involved, three policy respondents also focused on currently under-represented groups. In this regard they discussed who *ought* to be included and emphasised the desire to engage with under-represented sectors of society. Representative Three from Energy Company One focused on middle-aged women, for example, due to their absence from both the workforce and from more general engagement with the facility. Representative Three went on to state that Energy Company One were 'actively going to choose those and try to get that group of the population involved'. Doug Bamsey also explained who he considered to be vulnerable groups – those that might not be recognised in energy developments. These included incomers and retired local people who had relatively little to gain from the construction works at Hinkley Point C and the job opportunities this would provide. In addition, he expressed concern for those

in need of housing because of the potential for rental prices increases as workers move in to the area. For Hergen Haye, the necessity of including under-represented groups was often accompanied by the acknowledgement that it is necessary to engage with stakeholders with opposing views, including 'some environmentalists who think what we are doing is the worst thing we can ever imagine… You have to listen to them and understand where their concerns are coming from'.

In addition to engaging with environmentalists, Hergen Haye stated that for his role, he was answerable to a number of stakeholders. Firstly, he identified that his overall responsibility was to provide energy to the national population, who he believed were primarily concerned with affordable prices. Secondly, he identified stakeholders as being the local community in which the station was built. Latterly, he identified a responsibility to business and industry since (1) they were reliant on large quantities of base-load energy, and (2) the nuclear industry and associated wider industry groups themselves created and sustained a broad spectrum of jobs and careers that could capitalise on – in this case – a new fleet of nuclear power stations. In this regard, the results demonstrated a sense of dual responsibility to both national and local stakeholders. This sentiment was reinforced by Joel Kenrick, Special Advisor for now-defunct Department of Energy and Climate Change (DECC), who stated that the key stakeholders are the local community and workforce, but that because nuclear has the potential for such a big impact there also needs to be national level discussions; 'you cannot just say, well, if the people in Somerset want to have Hinkley then go ahead. There does need to be a discussion at a larger level'. He continued:

> '*I think in Hinkley it is the local community and the workforces who are there. I suppose they are the key stakeholders I would say... but because nuclear has such a potentially big impact there also needs to be national level discussions about this, right?'.*

Continuing this theme, Steve Thomas, Professor of Energy Policy at the University of Greenwich, distinguished between taxpayers and consumers as he stated that 'they are the same people but the distributional effects might be different. If you subsidise it comes from the same people, but some people might pay more…you know the rest'. In this context, and in keeping with the distributional justice articulation presented above, there was not only a concern for the cost of nuclear power, but the different sections of society that were burdened. Here recognition was given to the energy purchaser as a consumer of a commodity.

Finally, in addition to variation in energy justice articulations according to the actor in question, it was possible to identify variations according to the lifecycle stage of the power plant. Alongside comparing articulations of energy justice across different stages of the nuclear energy system (energy production and waste) the results found that each stage – in this case, production – was subject to its own lifecycle variation. This includes the simultaneous decommissioning of Hinkley Point A, operation of Hinkley Point B and construction of Hinkley Point C, all on one site. Robert Birkenhead stated in relation to employment opportunities created by the new Hinkley Point C developments, for example, 'there will not just be employment at Hinkley Point, there will be employment to serve the 900 people who are going to work there, 450 of those 900 will probably evolve from the B station, and the A station as it stops doing its decommissioning and goes into safe storage'. Thus, the different cycles of a station's development required engagement with a different set and number of actors. Furthermore, according to Doug Bamsey the Hinkley Point A primarily revolves around issues of waste, contamination and safety, as opposed to the area transformation focus present in the case of Hinkley Point C.

5.1.2.2 Justice by Whom?

In addition to considering the question of 'justice for whom?', interview respondents also highlighted, albeit more briefly, who they perceived to be responsible for

remediating injustices, or conversely, ensuring the continuation of just practices. Consequently, the results advance the energy justice literature to question who is responsible for the inequity and/or its remediation. The results reflect on both evaluative and normative examinations as respondents considered (1) who *is* responsible (evaluative) and (2) who *ought to be* responsible (normative). Further, respondents reflected both on their own responsibilities and on those of others, acknowledging, therefore, that all groups represented in this research study – NGOs and policy – are involved in both the production and continuation of energy justice. Evidence supporting this assertion is given below. The results are presented firstly from NGO respondents and secondly from policy respondents in order to highlight contrast, or more pertinently in this case the similarities, between their given perspectives.

NGO respondents' responses were split across two sectors, (1) responsibility of non-NGO groups and (2) responsibility of their own faction to continue to represent their views. Josephine Smolton reflected firstly on responsibility from external industry and policy groups, representing a focus on 'people at the top'. This included EDF workers, DECC, the ONR, and the Chancellor of the Exchequer in particular. Josephine continued by highlighting her belief that where they are representative of the government, these groups and individuals should be questioning whether investing in Hinkley Point C was sensible or not, with emphasis, in her opinion, on the fact that it is not. Josephine's discourses reflected the opinion that this role was not being performed well. Restating the importance of DECC and ONR in decision-making around Hinkley Point, Sue Aubrey not only highlighted the importance of their role, but questioned their suitability for it. Sue noted in particular that when Stop Hinkley attended DECC and ONR meetings, a large contingent of the DECC representatives were recent graduates from Oxford and Cambridge. Given their youth, Sue reported that they lacked historical awareness and experience – including knowledge of the 1988 Hinkley Point C inquiry and the Flowers Report, for example. Thus, without a working oral history and information being passed on, she believed that they were

not able to adequately address the questions that they were being asked. Finally, Nichola Clark reflected on the difficulty of identifying who is ultimately responsible as she stated that 'you cannot say who because we have structured our society in ways and we have put procedures in place that perpetuate this and all the other stuff that we are getting completely wrong'. She closed that whilst the government might be described as being ultimately responsible, the government is hard to define and is constantly evolving. She also added that companies come and go and EDF probably will not exist in 150 years time.

NGO respondents also discussed the on-going role of NGO organisations themselves as contributors to energy justice, given their assumed role in commenting on operations at the Hinkley Point site. Sue Aubrey outlined that historically NGOs were paid to make such contributions – Greenpeace was employed as a key voice for one NGO during the 1988 inquiry, for example. Now Sue believes that despite her on-going engagement and interest, Stop Hinkley is not big enough to make a notable impact. Building the case for the role of NGOs, Josephine Smolton drew on her personal experiences of the latest Hinkley Point inquiry, where she got the impression that 'the people who were making the decisions were relying on groups like us, and other NGOs presumably, to point things out to them so that they could investigate it a bit further'. However, she did reflect negatively on whether that was appropriate, as she continued that at the time she was thinking 'wow, this is worrying because I have only been involved with this for a little time and they are actually going to look at what my comments are to decide on what they are looking at?'. In this regard, Josephine reflected with some discomfort that her opinions took such a role. Finally, Nichola Clark stated that part of what makes her continue to work on the nuclear issue is her own sense of responsibility to both wider society and to her children and as yet unborn grandchildren.

Policy groups also attributed responsibility for the enactment of energy justice. Robert Birkenhead outlined his opinion that post-privatisation of the energy sector

the responsibility for energy justice was shared between the industry and the government, based on the ideas that firstly, the industry want to make money from that station, therefore it is in their interests to ensure that it can do so, and secondly, the government wants to ensure continuity of supply for its citizens. Responsibility was attributed to regulators and site developers as an outcome of government procedures. Representative Two from Energy Company One stated, for example, that following the reviews on their planning application they have to prove that they have understood all issues and undertaken appropriate checks. In this regard it was their responsibility to ensure due process, with oversight from government bodies. Giving a less positive overview of the drivers of due process, Steve Thomas stated that 'if you are EON or RWE or EDF, you are looking to fulfil what you are obliged to do at the minimum cost to yourself. You should not be surprised when that happens. Their shareholders would be very upset if they were acting with a social conscience. It is not their fiduciary duty to have social consciences and spend shareholders' money on that'.

Finally, Doug Bamsey gave attention to not only policy groups at the national level, but at the local level too as he discussed the responsibility of local councillors and MPs to serve as a conduit for information provision. He suggested, as an illustration, that the role of the Parish Council was to guide local groups, 'let them digest the information and with time, develop their own opinions'. Doug also cautioned about complexities in the role of local bodies, as in this case most developments came through the Sedgemoor District Council despite the fact that the station itself is in West Somerset. For Doug, this resulted in difficulties in establishing who the local-level lead is.

5.1.2.3 Summary of Justice as Recognition Articulations

The results presented above provide a series of insights into justice as recognition in practice as they relate to the Hinkley Point Nuclear Complex. Primarily, they

demonstrate that calls for justice as recognition vary according to the sample group in question. In this regard, operations at the Hinkley Point Nuclear Complex were not perceived to be to the benefit or burden of any one particular social group, but rather a range of groups. As outlined above, this included those at risk of potential health impacts, international actors that were not represented in decision-making processes, women, future generations, the electricity consumer, youth, workers, and the local community within a defined impact zone. Furthermore, they show that justice as recognition discourses vary not only according to the sample group, but also according to the lifecycle stage of the facility in question. As a consequence of the lifecycle variation of each station – Hinkley Point A, B and C – employment opportunities fluctuate as facilities either enter decommissioning, operate or in the case of Hinkley Point C, are constructed. In this regard the different cycles of a station's development require engagement with a different set and number of actors. Finally, they illustrate that NGO respondents take a cross-scalar approach to recognition discourses, drawing case studies from across the local-global spectrum, in opposition to policy groups who typically focused on the local and national levels.

In addition to these empirical findings, the results demonstrate novel insights due to the methodological approach used as they reveal not only who justice is for, but also who is responsible for it. They demonstrate that whilst all groups represented are involved in both the production and continuation of energy justice, industry and policy respondents are assumed to have a higher *degree* of responsibility. Within these statements, respondents also reflected both on their own responsibilities, therefore acknowledging that all groups represented in this research study – NGOs and policy –have a role to play in both production and continuation of energy justice. A summary of these findings is provided in table 5.3.

Question	NGO	Policy
Justice for whom?	• Cross-scalar: Workers • Those affected by health impacts • International actors • Future generations	• Local and national: • Consumers • Youth, • Workers • Local community
Justice by whom?	• Industry • Policy • NGO groups	• Industry • Policy (Inc. local councils) • Regulators

Table 5.3 Summary of Justice as Recognition Results by Sample Group and Question

5.1.3 Procedural Justice

Throughout the interviews, all respondents referenced and evaluated a range of procedural mechanisms through which decisions about the Hinkley Point Complex were made. The mechanisms mentioned included the following stakeholder engagement and consultative exercises, which took place at the local, national and international scale:

- Local Site Stakeholder Groups (quarterly)
- The first Hinkley Point C Inquiry, led by Margaret Thatcher (March 1988-September 1990)
- EDF-led Public Meetings and Exhibitions in Bridgwater, Cannington, Combwich and Nether Stowey (2009-present)
- EDF Drop-in Sessions (intermittently beginning 2010-present)
- DECC NGO Forums (beginning September 2010, occurring semi-annually)
- The Second Hinkley Point C Inquiry, led by the Planning Inspectorate (March 2012-September 2012)

- Environmental Agency Meetings to discuss potential environmental impacts (Autumn 2012)
- The EDF visitor centre in Bridgwater (beginning December 2012-present)

Throughout the interviews the majority of procedural justice discussions revolved around the development of the new Hinkley Point C facility. The procedure consisted of EDF-led consultations prior to a six-month formal hearing led by the Planning Inspectorate, beginning in March 2012. For NGOs the discussions primarily took the form of critiques of their experiences of procedural engagement, including concerns over the scope of the discussions, the accessibility of mechanism both in terms of the technicality of the process and physical attendance, and the exclusion of individuals and groups from the proceedings. However, in addition to these critiques, four respondents also drew on positive experiences, offering insight into perceived 'just' processes. Policy respondents gave more mixed evaluations, reporting on both successful procedural mechanisms and areas of future development. In addition to describing current and past procedural mechanisms, respondents also described potential improvements to the procedural systems, providing normative insight into how procedural justice might materialise. Section 5.1.3.1 introduces the evaluative constructions before section 5.1.3.2 discusses normative constructions. In keeping with the format used above, the results are presented firstly from NGO respondents and secondly from policy respondents.

5.1.3.1 Evaluation of Procedural Mechanisms

Throughout the interviews the primary area of focus was on the legitimacy of the aforementioned procedural mechanisms i.e. their validity and effectiveness for achieving just outcomes. From an NGO perspective, discussions primarily took the form of critiques, including concerns over (1) the scope of the discussion, (2) its accessibility, both in terms of the technicality of the process and physical attendance,

(3) the timing of procedural engagement, and (4) the exclusion of individuals and groups from the proceedings. Each of these ideas is exemplified in turn below.

Considering the scope of the discussion, Sue Aubrey used the original Hinkley Point C inquiry in the 1980s as a point of reference, contrasting it with the 2012 Planning Inspectorate's inquiry into the proposed Hinkley Point C developments. Here she highlighted changing energy justice discourses through time. Sue praised the 1980s inquiry, which took around 18-months and was led by an inspector 'who took it seriously and really listened to people', including a trip to Chernobyl to assess potential damages in the case of a nuclear accident. Yet in contrast, Jill Sutcliffe, a member of the Nuclear Waste Advisory Associates, reflected on the Hinkley Point Inquiry in 1988/1989 with dissatisfaction. Jill ran the objectors office with consultation from CORE, Friends of the Earth, and Greenpeace, amongst others. Explaining that the process engaged around 600 participants, she stated that finding funding for the process was very problematic, leading to a 'David and Goliath' situation where the industry was given £30 million from the electricity board but the opposition camp was required to fund their own case. She concluded that in her opinion such processes are meant to look like democracy, but democracy is being stripped out of the processes. Sue and Jill were amongst the ten NGO respondents who all expressed frustration at the most recent 2012 inquiry into the development of Hinkley Point C.

Firstly, in terms of the scope of the 2012 Planning Inspectorate discussions Josephine Smolton of Stop Hinkley gave her opinion that the consultation topics were intentionally limited. Josephine stated that they were allowed to discuss the transport system, the effects on the tourism, and what the new Hinkley C facility was going to look like, but that they were not allowed to talk about the fact it was a nuclear power station, that it would produce nuclear waste, or that there were alternative energy sources: 'we were not allowed to talk about any of the important

issues actually and it was so frustrating'. In reference to a Planning Application Meeting in North Petherton, Josephine went on to say that:

> *'I was quite surprised at the comments that my peer group were saying as regards "we will go in there gagged" and I was thinking, "oh, that is a bit extreme", but actually that is exactly what we should have done! We should have actually explained that we were having our rights taken away with this façade – they were throwing money at this kind of "procedure" that meant nothing to anybody. It was there to allow us to think that something was going to be going on. Quite honestly, if they thought that that was going to be successful, they should have done it better because it was so apparent even at the first meeting that it was a façade'.*

Sue Aubrey reinforced this statement as she outlined that NGO respondents were directed to a narrow set of queries only and were not allowed to stray: 'I think we tried in very obscure ways of bringing in the things we wanted, but no'. Sue explained that from an NGO perspective, the inquiry was not seen as a robust opportunity to represent their views and was taken to be a 'waste of time'. She continued:

> *'I suppose that is the other thing I have learnt; the government tries to obscure the facts. Andrea Leadsom came to talk – she said there was less waste coming out of the new set of nuclear power stations and someone pointed out that yes, it was in quantity, but that it was far higher in fact in radioactive terms. Ed Davies made the same mistake. [Plus] EDF work in DECC – what they think about and what they talk about for nuclear power is not going to be objective, how can it be?'.*

This view was shared by Regan Scott who stated that site developers and planners are responsible for taking an impartial stance, whereas, at the moment, 'consultation

protocols seem to be being abused routinely with experts being taken on board by developers'. Allan Jeffrey agreed as he explained that throughout the decision-making process some councillors stood down from their positions because of vested interests in the power station, which he believed removed key people from the decision-making process, whereas one councillor who was part of the 'nuclear promotion society' retained his position. Allan reported 'that makes a crazy idea of democracy and I think there was a bit of fiddling that went on'.

Further, Roy Pumfrey gave his experience of the planning inspectorate hearings, the first of which was designed to discuss the motorway junction in Bridgewater. Roy recalled that the event was a huge affair, but that if you were not a council or EDF representative it was difficult to have any say, even if you had submitted what you wanted to talk about in advance. Roy commented that later consultative exercises were more intimate and user friendly, where you got to sit at a table with a microphone in front of you and where you could put your point across.

Finally, Nichola Clark also expressed her concerns as she explained that during her time as a spokesperson for Stop Hinkley on the DECC NGO Forums for the Hinkley Point C proposals, she had an issue with the process from the outset because of its terms of reference. Nichola stated that:

> *'We felt that the NGOs on a point of principle should probably pull out and refuse to engage with them unless the terms of reference were something that the NGOs agreed to. The terms of reference were "this is all about making new build go forward". Well, we were not there to make new build go forward and most people just decided to gloss over and ignore those terms of reference. Everyone is so desperate to have a seat at the table to talk to DECC that they are willing to gloss over stuff like that whereas I wanted to rip it out and say, "no, … we should be part of setting up the terms of reference". I think a lot of the*

reason DECC did that was to cover their ass and be able to say, "we had a process, look, it is legitimate"'.

NGO respondents also questioned the accessibility of procedural mechanisms, the second theme. Four respondents highlighted that when meetings did take place, they were not thoroughly advertised. For the 2012 inquiry Allan Jeffrey of Stop Hinkley explained to this end that individuals had to register up-front to engage with the process, and that past the original deadline it was not possible to participate. Josephine Smolton added that later on in the process, the time for contributions was limited. She stated 'that just smacks of corruption before you start, because they want to limit the people involved, they want to limit the time, they want to limit the interaction potential – you are only given two minutes or whatever it was'. Further, both respondents went on to highlight the application itself was launched over Christmas and had a two-week turnaround time, making interaction with the documentation impractical; for Josephine 'that was the first sign of, actually, we are not supposed to engage in this process, we are not supposed to look at it'. Finally, accessibility was also taken in financial terms. By way of an example Roy Pumfrey explained, in keeping with the views of Jill Sutcliffe surrounding the 1980's inquiry, that 'EDF funded planning officers up till the point the planning inspectorate was being heard, and then cut off the funding, so our council tax has had to go to pay for the council making representations to EDF – a substantial cost for West Somerset Council which is cash strapped and small'. He continued that for working people, 'there was precious little opportunity to put your voice across without losing opportunity to work and giving up time', and that part of the challenge was learning to write stuff in the sort of manner which the planning inspectorate responded to. In terms of accessibility then, the NGO stance was that the process was not designed to be user-friendly or to garner local opinion.

Continuing these ideas Nichola Clark reflected her dissatisfaction with the Site Stakeholder Groups for Hinkley Point as she stated that:

'If you look at the stakeholder groups that we have got at the moment for nuclear facilities, they are a joke. They are largely made up of people who are not going to ask too many questions or make things too uncomfortable for the industry. It is all a bit of window dressing really. I am sure whoever decided that stakeholders should be involved was being quite progressive and radical at the time, I am sure they had a vision of people like us trying to be involved, and yet what we have got is a few councillors, a few people from the industry. Do you know what I mean? It is not really grass roots'.

Speaking to the third theme, the timing of procedural engagement, two NGO representatives felt that procedural engagement came too late and in response to a 'foregone conclusion'. Sue Aubrey stated that it was being 'railroaded' and that they could not influence the decision-making process. In support, Roy Pumfrey added in relation to early meetings for the 2012 Hinkley Point C inquiry that they basically existed to say 'we have consulted, so there are going to be some new nuclear power stations and it really does not matter what you thought. Their consultation paper was not a consultation; it was "this is what is going to happen"'. In this regard both respondents felt that procedural engagement occurred too late and as a result, restricted their ability to meaningfully participate. Alongside this desire for engagement however, there was recognition that due to the long lifespan of the site – from Hinkley Point A through to Hinkley Point C and all of the decision-making junctures therein – there was also the potential for 'consultation fatigue':

'Because it is gone on so long people just say I cannot keep on doing this, or it is making me ill. I am not denying that. It is very depressing trying to keep going because of that time. It is such a long process it is wearing people down'.

Finally, two NGO respondents highlighted concerns over the exclusion of individuals and groups from the proceedings. This occurred both in terms of their accessibility, as mentioned above, and as specific exclusions of particular groups. Sue Aubrey

suggested that not everyone is welcome at Site Stakeholder Meetings, which are designed to be an on-going engagement mechanism throughout the lifespan of the facility: 'I do not think they like just anyone to go, although theoretically you can be an observer. They are always anxious about people who do not behave themselves. People that rant on are not welcome, they cannot cope with that. People have been excluded in that way'. This includes one individual who consistently raised the need for research into the health impacts of low-level radiation at DECC NGO meetings and had his requests rebuffed. For Sue the frustration over being the 'unwelcome' voice of dissent also extended to the inability for non-nuclear writers to contribute to the local press. For example, she stated that their local campaign group had struggled to get their articles published, attributing this to the belief that due to the high number of EDF adverts in the newspapers, the local press were scared of losing their advertising money.

Consolidating her stance, Roy Pumfrey highlighted the difficulty of being a challenger, using the example that even if EDF Energy were to offer more shares to the public to increase engagement, 'you have only got one vote and you would find that your stance is vastly outweighed'. Furthermore, Roy not only highlighted concerns over not being able to express his views, but also believed that they were not listened to even when he did. Calls for a Bridgwater bypass were not responded to, for example. Furthermore, Roy spoke about the jetty that is to be constructed as part of the new Hinkley Point C station, which can be used to unload material at Hinkley Point and is composed of a wharf and laydown area at Combwich. Roy believes that evidence produced by the Chairman of the Otterhampton parish council that suggests that the tides would not allow frequent or suitable use was ignored. He stated that campaign participants were asked repeatedly 'have your concerns gone away? Are you now content?', giving the impression that deals had been struck that ignored their concerns.

On the whole, NGO respondents reflected negatively on contemporary experiences of procedural engagement. Sue Aubrey believed that the difference between the 1980s consultation – which she praised – and the 2012 consultation could be attributed to the privatisation of nuclear energy in the UK. She believed that the first consultation led by the government to assess the Central Electricity Generating Board's Hinkley Point C proposals was publicised more widely and was more broad-ranging, allowing discussions over the role of nuclear and the privatisation of the energy sector for example. In contrast, she suggested that in the most recent industry-led consultation 'there was nowhere people could get the answer to their questions if they were asking "was it dangerous" because they just assumed it was going ahead'.

Policy representatives were also asked to evaluate procedural mechanisms. In the resultant discourses policy respondents highlighted both positive examples of procedural engagement successes as well as considering the difficulty of procedural engagement overall. Thus, policy respondents offered more mixed responses to articulations of procedural justice, reflecting on the themes of (1) the purpose of consultations, (2) low levels of participation, (3) concerns over accessibility, (4) consultation stage, and briefly, (5) concern for over-consultation.

On the whole, policy discourses reflected the sentiment that procedural mechanisms were understood first and foremost to be an opportunity to garner local opinions about the potential impacts of the Hinkley Point nuclear facilities. This included an opportunity to hear concerns about the new developments, explore possible opportunities to mitigate them and ensure that people's views were being accurately represented by spokespeople, including the local councils. Representative Three from Energy Company One stated to this end that:

> *'You know, the power station is going to be operational for around 60 years or so, and the only way we can operate with the existing power stations is with the*

support of the local community; if they feel they trust us to operate it safely and not to cause huge inconvenience to how they live their lives. So I think it is important to give the information out to the community and to genuinely be interested in their views'.

The aim, according to Representative One from the same anonymous company was to 'give good information to people in a timely way and to listen to what they have to say and what their concerns are'. In agreement, Representative Two also reflected that a broad spectrum of attendees to consultations was a positive opportunity, as 'to hear those questions, to understand them and to be able to answer them probably does us a lot of good in the longer term…it is good for us I think…otherwise it is too easy to become complacent and to assume everything is fine'. Doug Bamsey continued too that for some consultations the absence of debate around nuclear energy in general was productive, allowing a more focussed discussion on the practical impacts of local developments.

Doug Bamsey explained that the emphasis for engagement procedures was now on front-loaded stakeholder-driven practices, which in his opinion represent a departure from past techniques that emphasised persuasion tactics and financial compensation, illustrating an evolution of procedural mechanisms through time. He added that government consultations were driven by both mandate and a concern for best practice. Early on then, there appeared to be broad agreement on the current purpose of procedural engagements. Further, there was agreement that the general public – both locally and nationally speaking – had a right to be part of the decision-making process around energy infrastructures, though from the offset the mechanisms of achieving this were problematised. Niall Riddell gave insights into the issues:

'People definitely have a right. So, I mean, the kind of thing we have in our legal and structured system at the moment is we have a planning process which enables decisions around where stuff should be built, and whether or not it

should be built, and whether people have specific objections to it to enable people to get engaged in that process.

Within such processes, policy respondents revealed that the procedural mechanism in question varied according the station, whether it was A, B, or C, and therefore the stage that the station was at in its lifecycle: decommissioning, production or procedure. This highlights an often-understated dimension of procedural justice, that demands for procedural justice are not consistent through time. Doug Bamsey reported in line with this that local consultation is not required for the extension or decommissioning processes that have been affecting developments at Hinkley Point A and Hinkley Point B facilities. Further, he added that for all stations consultation primarily occurs at the start of the development process, after which different mechanisms take over. In the case of Hinkley Point A and B this includes the Site Stakeholder group, which is part funded by the Nuclear Decommissioning Authority and EDF. Robert Birkenhead agreed as he stated in relation to the A and B stations:

'For them there is what is called the Site Stakeholder Group. It is a group of someone from EDF and someone from Cavendish Fluor, who operate Hinkley Point A, and then there are representatives from various councils and various organisations, county council and the parish councils, who form this group. It is chaired by someone who is not [from] *EDF; at the moment it is chaired by one of the Sedgemoor District Councillors. They meet and EDF tell them what is going on at Hinkley Point A and B. It is an informative situation where they can inform the local people and some of the people on the group … They have that at every power station, so that is the local engagement'.*

Alongside explaining the purpose of procedures, policy respondents also reflected on negative experiences. Niall Riddell problematised the scale of decision-making, for example, as he stated that illustrated that gaining national consent provided different challenges to local consent:

'So, the problem… is [that] you then have things like national planning statements, where government has put forward its perspective of what it believes should happen. And unfortunately, a lot of the time large infrastructure projects tend to be perceived relatively negatively'.

For Joel Kenrick each social group – whether local or national – was entitled to a different set of decision-making processes. Such discussions highlight trade-offs in the perceived entitlement to information and input, where local consultations focused on site impacts but not on the ethics of nuclear energy more generally. In this regard, the rights of local communities were perceived as being different to those of communities further afield, where they received intimate-scale, hands-on attempts to mitigate injustices and encourage benefits.

Representative Two from Energy Company One identified two reasons for failings in the consultative process: (1) that local people often do not believe that their voices are going to be listened to, and (2) that they assume the deal is already done. This included highlighting frustration over the low degree of participant uptake in consultation procedures, the first critique from policy respondents. Respondent Three from Energy Company One stressed that they were keen to hear people's views as they aimed to mitigate the disruption caused during the construction phase of Hinkley Point C:

'We will try and mitigate against that but we can only do that effectively if we get local opinion telling us actually you know, what you are thinking about this access road here, we would much rather it were there, or whatever. You cannot get that if people are staying at home watching Emmerdale'.

Respondent Two also reflected that generally attendance is poor as he recalled that 'if you are getting 5% of the population you think you are doing well'. It appears to be the case then, that by removing barriers to procedural engagement there is an

opportunity to improve the experience of both sample groups – NGO and policy. In agreement, Representative Three stated that:

> *'If you take ambivalence as a measure of success then we have been hugely successful. With any consultation, you know, it is a very self-selecting group who tend to come along, they tend to be older, they tend to be middle class, articulate… and it is the same for any consultation. How do you engage younger people in the process? It is extraordinarily difficult'.*

Respondent Three continued that given the small attendance at consultations, they have to think about different ways of reaching those audiences. This includes opening an office in the Bridgwater town centre and attending town meetings. He recalled the 2007 central government consultation on the future of nuclear power, where he outlined that there was an attempt to engage was many people as possible in the process, but that it was not as successful as it could have been (because, in his opinion, a lot of people were not aware it was happening), only gaining the opinions of quite a self-selecting group of people. He added that it is very difficult to engage genuinely undecided people, but that this group probably represents the people that you need to be talking to and develop a dialogue with. Without this you 'are left to rely upon those who have already got very fixed views'. In this regard, the respondent demonstrated an overlap with justice as recognition as he highlighted that those who are absent from procedural mechanisms ought to be engaged.

With regards to the second policy critique, consultation accessibility, Doug Bamsey stated that local communities are frequently frustrated by the complexity of developments, the length of the process and the technicality of some information, which he felt precluded some social groups. Further, he highlighted that previous government-granted public access funds had been withdrawn, leaving communities unable to access the resources required to engage. Doug continued that the issue is now that you are limited to how much you can influence the technical aspects of a

development: ‘instead, they engage at the margins, where developments interface with local communities’. Robert Birkenhead also reflected on the potential to exclude particular social groups based on their geographical location. He identified that no meetings about the potential developments at Hinkley Point were held in Burnham-on-Sea, despite the fact that geographically it is closer than Bridgwater and if there was an accident, they are in line with the prevailing wind.

Finally, policy members drew attention to the potential for over-consolation. Respondent Two from Energy Company One noted that the degree of consultation can often be counter-productive; ‘they have only seven nights of the week and they have got eight consultations to do, so how do they manage it? They have got to give one up’. These concerns not only reflected the number of consultations but the number of bodies hosting them, including the government, the National Grid, the Environment Agency and the Nuclear Installations Inspectorate. Doug Bamsey added that the EDF visitor centre remains the legacy of the drives for a long-term presence outwith these intense periods of consultation.

5.1.3.2 Normative Improvements

In addition to describing current and past procedural mechanisms, both NGO and policy respondents also described potential improvements to the procedural systems, albeit more briefly. In so doing the respondents provided normative insight into how procedural justice might materialise and drew attention to the core values that underpinned these mechanisms. Further research could engage with this theme in more depth. The results are presented firstly from NGO respondents and secondly from policy respondents.

Speaking from an NGO perspective, both Sue Aubrey and Jill Sutcliffe raised the issue of financing consultations. For Sue, external funding for campaign groups would allow people who have full time jobs and do not have much time to participate fully

to engage more as, if they were being paid to not work they could put more effort in. She added that it would also enable people to ask whatever questions you want, without which engagement seems pointless. Jill continued that as a case study of alternative mechanisms, Sweden funds objectors to nuclear power, giving her belief that 'they are more interested in the right answer than becoming complacent; a critical voice can raise problems you have previously glossed over'. For Jill, she believed there was a tendency within any industry to lose a common-sense touch, and in the Swedish case they were paying to make a better decision. As an extension, Regan Scott believed that community groups should be given 'interested party status' automatically, and that as part of that, planners 'should deliberate in public sessions, not on paper behind closed doors'.

In addition, Nichola Clark raised the concept of Nuclear Guardianship, which was based on the work of Joanna Macy in her book, Despair and Empowerment in the Nuclear Age. Nichola explained that she thought the concept of nuclear guardianship should be taught in schools and be part of the curriculum everywhere. She went on to state that 'it should not just be an issue for the communities who have got facilities to have to deal with while the community over there does not have to think about it. It is far too important for that. Everyone needs to have some basic skill and appreciation of the issues. Given its inter-generational nature, that is a really important part of what is missing. We are not even going to create a society where people are going to make good decisions until everyone is a bit better informed'. Nichola finished that for her, she always questioned the stories she was going to tell her children so that they grew up with a literacy of the issues and a willingness to engage. Thus, she gave her opinion that nuclear energy should be part of the school curriculum.

Regan Scott identified that in her opinion, energy justice is an issue over where planning power lies, where in her opinion, the UK's new national infrastructure planning law is very wrongly anti-local voice. Thus, she identified that going forward,

siting processes must have a strong local community presence, and that national vetoes must be easily challengeable. Finally, normatively speaking, Josephine Smolton outlined that she believed that Hinkley C was being sited in the local area because of the pre-existence of Hinkley Point A and B, but that in fact they are very different projects. She closed, 'it is like always having a doughnut and suddenly being given a cream slice'. In this regard, Josephine highlighted the need for independent nuclear new build decision-making processes.

Both Doug Bamsey and Representative One from Energy Company One gave policy perspectives on how we *ought* to engage. Doug Bamsey highlighted that where concerns over injustice were raised he saw an on-going role for community benefit mechanisms, including long-term payments for local hosts and the facilitation of local support as a means of recognising the role of local communities in national gain. Policy respondents also queried when procedural mechanisms should occur during the development of a site – whether it is new build or an alteration to a pre-existing facility – offering the broad agreement that it should be as early as possible within a given decision-making process or in a site's development. Representative One from Energy Company One offered their opinion that the most recent round of consultations were marred by the first, insufficient, consultation, hindering progress on nuclear development of the site. He went on the give the example of how the process should be undertaken:

> *'If you go in and say this is what we are going to do and do not worry about it, it will all be fine and it will all be over in five years and then you can go back to normal, then you will get an adverse reaction. If you go to people and ask what are your concerns, listening and see what we can do about it, then do go back to them and say this is what we propose to do about those issues, we are going to put it in place, we are going to invest in improvements on that particular road junction, whatever it might be, then people say OK that is fine get on with it then'.*

Moreover, Joel Kenrick stated his belief that the threat of a judicial review ensured emphasis on due process. He continued that the permissions for the new Hinkley Point C development took so long because of the number of reviews it was subject to, but that this was necessary. In this regard, Joel made a place for the continued oversight of regulatory bodies in the provision of just decision-making.

5.1.3.3 Summary of Procedural Articulations

Alongside a high level of evaluative detail, the results of this section have provided key insights into the manifestation of procedural justice in practice. They have demonstrated that articulations both vary according to the actor in question and through time. NGO respondents critiqued their experiences of procedural engagement, including concerns over the scope of the discussion, its accessibility (both in terms of the technicality of the process and physical attendance), the timing of procedural engagement, and the exclusion of individuals and groups from the proceedings. Policy respondents, on the other hand, offered more mixed evaluations, as they reflected on both successful procedural engagements, the purpose of consultations, low levels of participation, concerns over accessibility, consultation stage, and briefly, concern for over-consultation.

Secondly, extending the theme of time further, the results also demonstrate that procedural justice manifests as both evaluative statements concerning what *is* done, and normative statements reflecting on what *ought* to be done. Normative constructions of procedural justice reflected on the themes of openness, transparency, knowledge transfer, knowledge independence and the order of decision-making. In reflecting on how we ought to engage, the respondents gave insight into the perceived core values of just energy decision-making. Thus, overall, the findings have illustrated that the procedural justice concept, and the concept of energy justice more generally, can play a role in current and future energy decision-making.

Moreover, respondents discussed primarily local issues revolving around local villages. Little reference was given to wider regional impacts, including the need for transmission networks, and mention of international scale concerns were entirely absent. A summary of these findings is provided in table 5.4.

Sample Group	NGO	Policy
Evaluative	• Scope of the discussion • Accessibility (technicality of the process and physical attendance) • Timing of procedural engagement • Exclusion of individuals and groups from the proceedings	• Successful consultations • Low participation levels • Accessibility concerns • Consultation stage • Over-consultation
Normative	• Financial support • Transparency • Nuclear Guardianship/education • Local community-led • Independent	• Community benefit • Regulatory oversight • Consultation timings

Table 5.4 Summary of Procedural Results by Sample Group

5.2 Conclusion

This chapter has presented results from the first of the two case studies – the Hinkley Point Nuclear Complex in Somerset – thereby addressing the overall research question of this thesis, 'how do elite actors within the nuclear energy system articulate energy justice?' from an energy production perspective. It has done so by

exploring energy justice articulations across three tenets: distributional justice, justice as recognition and procedural justice. Throughout, all evidence was presented with attention to the analytical themes of time and actor, allowing later comparisons across the third variable of investigation, systems component through a comparison with the second case study – waste storage, disposal and reprocessing. The evidence has demonstrated the utility of this methodological approach in identifying the primary energy justice discourses surrounding the Hinkley Point Nuclear Complex.

Within the tenet of distributional justice the results above provide two main insights into discourses around the Hinkley Point Nuclear Complex. They demonstrated, firstly, that articulations of energy justice did not just focus on the nuclear facility itself, instead manifesting as concerns over its associated developments, including local road infrastructure and the necessity of recognising 'non-nuclear' concerns. Secondly, the results demonstrate both variation and consistency in the distributional justice articulations according to actor in question, thus moving past typical pro-nuclear and anti-nuclear divides. In many instances, NGO respondents focussed on occurrences of 'injustices', points at which the site was perceived as negatively affecting the local area, whereas policy groups focused positively on the provision of 'justice' in terms of local benefits. Within this framework, NGOs were typically understood to be the recipients of just or unjust practices, and policy groups as the providers. However, the results also demonstrated united concerns over the costs of new nuclear power. In this regard, energy justice was characterised by both the distribution of benefits and burdens.

For the second tenet, justice as recognition, the results of the interviews gave insight into the questions of not only 'justice for whom?' but also 'justice *by* whom?'. Firstly, the results demonstrate that calls for justice as recognition varied according to the sample group in question. In this regard operations at Hinkley were not perceived to be to the benefit or burden of any one particular social group, but rather a range of groups. By considering the question of 'justice *by* whom?', the interview respondents

highlighted who is perceived to be responsible for remediating injustices, or conversely, ensuring the continuation of just practices. In discussing this idea of responsibility the respondents advanced the typical application of justice as recognition, which, generally speaking, has focused on the recipient of benefits or ills only, not those who create them. In terms of attributing responsibility, the results demonstrate that whilst everyone was perceived to share responsibility for injustice both groups identified that government and industry were ultimately responsible for energy production operations. Within this framework, they are the providers of energy justice, and the NGOs the assessors.

Finally, the results reveal manifestations of procedural justice in practice. They have demonstrated that articulations of procedural justice vary according to the actor in question. Moreover, these discussions also represented opportunities where respondents believed it possible to remediate injustices. In this regard, the results presented above give both evaluative accounts of energy justice around Hinkley Point *and* provide normative recommendations of how it 'ought to be'. Constructions of normative statements around procedural justice reflected on the themes of financial support, transparency, Nuclear Guardianship, local community-led decision-making, independence, community benefit, regulatory oversight and consultation timings. In reflecting on how we ought to engage, the respondents gave insight into the perceived core values of just energy decision-making. This illustrates that the procedural justice concept, and the concept of energy justice more generally, can play a role in current and future energy decision-making.

Table 5.5 presents simplified findings from this case study as a means of contrasting them to the other case study – waste storage, disposal and reprocessing at Sellafield in the UK.

Tenet	Sample Group	Themes
Distributional Justice	NGOs	Disruption during infrastructure development, radioactive contamination, heath and safety, cost
	Policy	Jobs and economic prosperity, education, disruption during infrastructure development, cost
Justice as Recognition	NGO	**For Whom:** workers, those affected by health impacts, international actors, future generations **By Whom:** industry, policy, NGO groups
	Policy	**For Whom:** consumers, youth, workers, local community **By Whom:** industry, policy (Inc. local councils), regulators
Procedural Justice	NGOs	**Evaluative:** scope of the discussion, consultation accessibility, the timing of procedural engagement, the exclusion of individuals and groups from the proceedings **Normative:** financial support, transparency, Nuclear Guardianship/education, local community-led, independent
	Policy	**Evaluative:** successful consultations, low participation levels, accessibility concerns, consultation stage, over-consultation **Normative:** community benefit, regulatory oversight, early consultation

Table 5.5 Hinkley Point Nuclear Complex Results Summary

Chapter 6: Waste Storage, Disposal and Reprocessing: Sellafield Complex, United Kingdom Results

This chapter provides an overview of the energy justice themes emerging from the semi-structured interview data around the second of two case studies, waste reprocessing, storage, and disposal at the Sellafield nuclear complex in Cumbria. Results are presented throughout section 6.1 according to the three tenets of energy justice: distributional justice, justice as recognition and procedural justice. This addresses the overall research question – 'how do elite actors within the nuclear energy system articulate energy justice?' – from a waste reprocessing, storage, and disposal perspective. Throughout, attention is paid to the analytical themes of time, systems component and actor. This approach allowed comparability across the responses garnered from each of the research groups sampled: 16 NGO respondents and 21 policy respondents[4]. Section 6.2 then draws together common themes emerging from the results and presents them in table format as a means of contrast to the other case study of examination, the Hinkley Point Nuclear Complex in Somerset. To allow comparability with the Hinkley Point case study, this analysis takes a cut-off point of the 1st of January 2016, after which no further empirical investigations were undertaken.

6.1 Articulations of Energy Justice: Sellafield Complex Results

The themes presented throughout this results chapter were derived from both top-down coding based on the research questions and literature, and bottom-up coding emergent from the interview transcripts. During the first phase of top-down coding using NVivo, excerpts, quotations and passages were coded into themes designed to mirror the interview question framework, focussing on distributional justice, justice as recognition and procedural justice. Following explorations of similarities and

[4] The term 'policy' or 'policy organisations' is used throughout for simplicity's sake. This group contains policy as well as industry representatives and academic experts, as discussed in section 3.4.

differences between the emergent codes, new group codes were then created that captured the meanings of information within them. This bottom-up process allowed identification of new details from the interviews. Overall, this analytic approach to the data analysis not only allowed for in-depth exploration of the texts, but of comparisons between the three variables of investigation: time, systems component and actor. This process is outlined in full in section 3.5. In all sections of this chapter the results are presented firstly from NGO respondents and secondly from policy respondents in order to highlight contrasts between their given perspectives.

During the interviews the respondents requested varying degrees of anonymity, which are outlined in table 6.1 overleaf. Where participants requested full anonymity, their names, positions and organisations have been removed and the attributions randomised.

Name	Position	Name
NGO		
Janine Allis-Smith	Campaigns Coordinator	Cumbrians Opposed to a Radioactive Environment (CORE)
Jean McSorley	Independent Consultant. Former head of Greenpeace International's nuclear campaign in Asia; member of the Australian Nuclear Safety Committee from 2000-2003	Author of *Living in the Shadow, the Story of the People of Sellafield* (Pan 1990)
Jill Sutcliffe	Member of Conference Coordinating Group, Member	Low level radiation and health conference, Nuclear Waste Advisory Associates
Martin Forwood	Campaigns Coordinator	Cumbrians Opposed to a Radioactive Environment (CORE)
Pete Roche	Press Officer	Stop Hinkley, No 2 Nuclear Power
Ruth Balogh	Nuclear Issues Campaigner	West Cumbria and North Lakes Friends of the Earth
Eurig Scandrett	Chair	Friends of the Earth Scotland
Pete Wilkinson	Director	Wilkinson Environmental Consulting Ltd
Regan Scott	National Secretary Research and European Coordination	UNITE, formerly TGWU
Policy		
Andy Blowers	Emeritus Professor	Open University
David Elliott	Professor	Open University
Steve Thomas	Professor of Energy Policy	University of Greenwich
David Sigsworth	-	-
Joel Kenrick	Special Adviser	DECC
Jude Maxwell	Sustainability Specialist	Scottish Enterprise
Ian Fairlie	-	-
Robert Armour	Chairman	Smarter Grid Solutions Ltd
Gregg Butler	Director/ Head of Strategic Assessment, Dalton Nuclear Institute	Integrated Decision Management Ltd/University of Manchester
Hergen Haye	-	-
Lynda Warren	Member	Committee on Radioactive Waste Management (CoRWM)
Brenda Boardman	-	-
Bill Hamilton	Head of Stakeholder Relations	Nuclear Decommissioning Authority
Oliver Epsom	Lead Mechanical Engineer	APL
Rep One	-	Energy Company One
Rep Two	-	Energy Company One
Rep Three	-	Energy Company One
Rep Four	Head of Sustainability, Generation	Energy Company One
Niall Riddell	-	-

Table 6.1 Summary of Sellafield Site Interview Participants

6.1.1 Distributional Justice

Across the two case studies, the Hinkley Point Nuclear Complex and the Sellafield Nuclear Complex, 12 distributional themes emerged from the interview discussions. For Sellafield, these included seven primary topics: radioactive contamination; health; military usages; jobs and economic prosperity; the cost of nuclear waste management; safety and emergency planning; and planning for contemporary and legacy wastes. Each of these themes is discussed here. These themes represent common threads of discussion and topics of concern as selected by the interview participants, and were identified via the coding process outlined above. As with the Hinkley Point Nuclear Complex case study, the extent and form of these concerns varied according to the time, systems component and actor in question. These differences are explored in the following paragraphs.

Discussions around Sellafield appeared primarily as temporally complex, with questions over legacy waste, contemporary management, and future handling, including the potential to move the waste from Sellafield into a Geological Disposal Facility. In this regard, the issue of nuclear waste management appeared to take a distinctive inter-generational pattern, looking both forward and back. To illustrate this temporal relationship, this section explores distributional articulations within the illustrative categories of historic, present and future energy justice articulations. In so doing the results illustrate that energy justice articulations vary through time.

6.1.1.1 Historic Articulations

In line with the presentation of results throughout the results chapters, NGO discourses are introduced first followed by policy discourses. The discourses presented here cover the themes of radioactive contamination, health, military usages, and jobs and economic prosperity. Of these, NGO respondents focused on

three particular themes: (1) radioactive contamination, (2) health, and (3) military usages.

Jean McSorley, an independent consultant on nuclear issues whose father had worked at Sellafield, drew on personal and professional experience to explore the first theme, radioactive contamination in and around the Sellafield complex. Jean explained, based on personal testimony of Sellafield workers and her family, what happened following a major fire in one of the Windscale Piles in 1957. Jean stated that it was only three days after the fire started that the authorities told the public of the widespread radioactive contamination from the accident. Jean's family, like others in the area, was given cans of condensed milk to use instead of fresh milk, as the milk from the surrounding region was considered unsafe to drink due to cows grazing on radioactively contaminated pasture. The impact of the Windscale Fire was what led, in part, to Jean attending a Greenpeace meeting in 1980, in her home town of Barrow-in-Furness; a shipbuilding town approximately 40 miles from the Sellafield site. The meeting was designed to discuss spent fuel transport from Japan to Britain. Despite anticipating a small audience, the meeting was attended by around 300 people, including a mixture of local workers and cancer patients. The meeting led to the creation of the campaigns group 'Cumbrians Opposed to a Radioactive Environment' (CORE), which started a campaign against the import of highly radioactive spent fuel into Barrow. Jean, one of CORE's founders, was campaign secretary until 1990.

Martin Forwood, now Campaigns Coordinator for the anti-nuclear group CORE, reflected that the group's campaign role had changed through time. He explained that whilst the campaign group initially protested against the import of nuclear waste through the port of Barrow, CORE later broadened its remit beyond its original anti-nuclear-waste-shipping focus to include campaigning against Sellafield's reprocessing facilities on the grounds that they were known to be a source of radioactive contamination. Martin added, as an example, that the rationale for the

Thermal Oxide Reprocessing Plant (THORP) at Sellafield, which was designed to reprocess waste to protect against uranium scarcity, had entirely disappeared by the time it came online, but that THORP went ahead on the back of signed contracts. Martin highlighted, therefore, that whilst the industry framed the practice of waste reprocessing as recycling, CORE perceived, and still perceive, that to be a myth. He went on to explain that the Central Electricity Generating Board (CEGB) provided evidence to the Sizewell B Public Inquiry outlining that the reprocessing operation creates 160 times more waste than the storage and disposal of the original material, and that after 60 years of operations at the site very little waste has been recycled. Instead, Martin explained that it has been stockpiled, leading to a steady increase in the hazard of the Sellafield site.

As a further illustration of concerns around radioactive contamination, Pete Wilkinson, the director of Wilkinson Environmental Consulting Ltd, recalled the actions of Greenpeace towards the site in 1983. Within this example, he explained that Greenpeace identified that 2 million gallons of plutonium-contaminated water was being discharged from the Sellafield site into the Irish Sea per day, leading to widespread radioactive contamination. As a consequence of Greenpeace's investigations and direct action at the site, which included attempts to block outlet pipes by boat, Greenpeace was fined £50,000 and British Nuclear Fuels Ltd, the then owner of Sellafield, £10,000. Alongside expressing concern over the perceived imbalance in the fines received, Pete reported that the radioactive discharges had ceased as a result. In this regard, Pete's case study highlighted that the risks posed from the site were not consistent through time, and that some management practices had been improved, with NGOs securing successes in renewing site policy. Reinforcing the incidence of successful interventions, Jill Sutcliffe, a member of the Nuclear Waste Advisory Associates, recalled the 1983 direct action of six people against the ocean dumping of nuclear waste. The group of six attempted to erect a tower on the train line carrying the waste to the sea. Although they were unsuccessful and were fined £2000, their efforts later secured the support of the

National Union of Seamen, who refused to carry the waste, thereby causing outright cessation of sea dumping.

Jill Sutcliffe referenced historical investigations into the health impacts of radioactive contamination, the second theme for Sellafield's distributional concerns. Jill cited the 1983 Black Report – an old but seminal contribution – which identified leukaemia clusters around Sellafield, as well as the work of Alice Stewart on the impacts of radiation on health between approximately 1956 and 1958. Such instances led to her involvement as part of the organising committee for the Low Level Radioactive Waste and Health Conferences, which aim to highlight the latest research on the health implications of radiation exposure and contamination. Jill stated that the industry's understanding for a long time was that only large doses of radiation were a risk, whereas Jill's opinion is that low-level radiation has also proved damaging. She added that radiation's invisibility does not help, instead leading to a reliance on experts to give evidence. She added, partially in jest, that 'it would be better if we came out in green spots'.

Finally, NGO respondents also spoke to the link between nuclear power and nuclear weapons. Ruth Balogh, a nuclear campaigner for West Cumbria and North Lakes Friends of the Earth, who was originally involved in the peace movement and anti-nuclear activities, stated that a major contribution of David Lowry's work during the 1980s Sizewell Inquiry was to demonstrate the links between the two, with implications for perceptions of Sellafield. As a summary, then, NGO reflections on the historical operations at Sellafield appeared on the whole as critiques on the grounds of its contribution to radioactive contamination, its negative health impacts and its connection with the military.

Throughout the interviews, policy respondents focused on three of the aforementioned distributional themes: (1) radioactive contamination, (2) military usages and (3) jobs and economic prosperity. In line with NGO discourses, policy

interviewees also highlighted concerns over past incidents of radioactive contamination as the result of both accidents and poor practice. Oliver Epsom, a former nuclear engineer and now engineer for SSE Renewables, highlighted the 'breath-taking incompetence' when it came to past handling of the site, stating that the workers at Sellafield had been 'chucking waste into swimming pools without even knowing how much you were throwing in there or where it came from'. Hergen Haye, an unattributed respondent who identified that the complexity of the nuclear waste problem in the UK was in fact the complexity of Sellafield, reinforced this view. In particular he cited the hazards of the highly radioactive waste produced by the weapons program, the damage done to the Windscale Piles during the 1957 fires, and the existence of their associated storage ponds and silos, for which there is no known inventory. Lynda Warren, a member of the Committee on Radioactive Waste Management (CoRWM) further echoed his sentiments as she stated 'there is no doubt that things have been left in a worse state than they should have been'.

Joel Kenrick, Special Advisor for the now-defunct Department of Energy and Climate Change (DECC), explained that these hazards at Sellafield continued to build throughout the decades following Sellafield's construction:

> *'The thing about Sellafield that I did not realise when I went to Cumbria, is how recent the mess-ups were. It was not just that we messed things up in the 50s and 60s; these were conscious decisions that the nationalised energy industry made in the 70s and 80s. There are people who should have faced serious charges in court for things that went on in those days in terms of decisions that were taken'.*

Joel explained that during the miners' strike in the 1970s and 1980s the decision was made to push power stations harder than they could go, knowing that there was no means of dealing with the waste that was produced. He added, 'surely that is a criminal offence?', especially when, in his opinion, people then knew about the risks.

Gregg Butler, the director of Integrated Decision Management Ltd, suggested that the existence of radioactive hazards were linked to the haphazard development of the Sellafield site. He stated 'you would not design to end up with a Sellafield, but if you start in 1946, which the program did, with the perceived urgent need to have a nuclear weapon, you do things with that driver behind you. You do things literally to get progress, and you do not worry too much about how you are going to clear it up afterwards'. Gregg Butler identified that modern-day Sellafield was inextricably bound with the Sellafield Piles and later, the Calder hall power stations, which were designed to produce plutonium for defence purposes. For Robert Armour of Smarter Grid Solutions Ltd, the past military link was also clear as he recounted that Sellafield 'was seen as both a huge technical hope and a quasi-military establishment, making the atoms for peace and atoms for war distinction quite problematic'. These examples illustrate two points: firstly, that Sellafield was initially viewed positively by policy respondents on the basis of its contribution to the weapons program, and secondly, that it was the then management of the site that was responsible for perceived injustices today; the existence of both known and unknown sources of radiological risk.

As further evidence of concerns over management practices Gregg Butler remarked that 'it was almost an afterthought that the nuclear reactors could produce power'; he explained that Magnox power stations capable of using reprocessed fuel and producing military plutonium were developed on the assumption that uranium would become scarce, and that the out-coming plutonium could be used for fast breeder reactors. However, he added that uranium did not become scarce and therefore a design which reprocessed fuel was not necessary; 'so, if you started with knowing what we know now, you would find a way of getting yourself plutonium for our independent nuclear deterrent, but it probably would not be as big, as cumbersome and as messy as Magnox reactors'. This reflects his opinion that the decisions made during the early stages of the Sellafield site were unnecessarily complex. Further, Gregg also reflected on the changing socio-economic landscape of

the surrounding area and its influence on the Sellafield site. Gregg explained that historically, West Cumbria has around 30% of the railway lines in the UK because of the mines and quarries, which fed the region's iron and steel industry. A government-funded Volvo bus factory also later closed. Now that these facilities have ceased operation, the only major employer in terms of high-qualification, high-pay employment is Sellafield.

For policy respondents, where positive stances were expressed they emerged as normalisation discourses. By way of an example, Gregg Butler praised the fact that so little had gone wrong during Sellafield's early history, especially as American nuclear developments were subject to several criticalities. He stressed in this regard, that things at Sellafield could have been worse.

In summary, there was notable critique of the Sellafield site from both sectors represented in the interviews – NGOs and policy – as acknowledgement of apparent historical mishandling of the facilities at Sellafield and as a consequence, the radiological burdens they presented.

6.1.1.2 Present Articulations

Speaking in the present tense, there was a more complex division in the views held towards the Sellafield site. Firstly, there was a consistent concern about radioactive contamination across the two sample groups. Thereafter, NGO respondents focussed on occurrences of 'injustices', points at which the site was perceived as negatively affecting the local area, whereas policy groups focused positively on the provision of 'justice' in terms of local benefits. As with the Hinkley Point case study, NGOs were typically understood to be the recipients of just or unjust practices, and policy groups as the providers. Across the two sample groups, these discourses focused on five of the aforementioned core distributional themes: jobs and economic prosperity, radioactive contamination, the cost of nuclear waste management, health, and

safety and emergency planning. Throughout this section, NGO discourses are again introduced first, followed by policy discourses.

In the present-day context, NGO respondents focused on critique of the Sellafield Nuclear Complex on the grounds of four of the abovementioned distributional themes: (1) jobs and economic prosperity, (2) radioactive contamination, (3) the cost of nuclear waste management, and (4) safety and emergency planning, before expressing reluctant acceptance of the need to address legacy nuclear wastes. Giving an NGO perspective on the first theme, jobs and economic prosperity, Martin Forwood (CORE) stated that despite the fact that economic input into the area was high in terms of employee numbers – around 10,000 permanent positions and 2000 contractual – local deprivation in the nearby villages of Seascale and Whitehaven was on-going, adding that they were still 'time-warped and deprived'. Thus, in his view, the employability and economic benefits of the Sellafield nuclear complex were not extant. Further, he believed that Sellafield had dominated the local landscape, causing the local population to become dependent on the jobs it provides, therefore preventing non-industry investment. In this regard, he characterised West Cumbria as 'a nuclear state it its own right'. Martin's statements exemplify the view from NGO respondents that the jobs and economic benefits from Sellafield were not well distributed.

Speaking in relation to the theme of radioactive contamination, Pete Wilkinson described his work in characterising the nuclear waste within the historical ponds and silos present on the site, including B30 and B38 in particular. Pete explained that 'the plant itself is ageing and a lot of the facilities are leaking. The entire groundwater under Sellafield is contaminated. The whole place is just an absolute disgrace'. He went on to label the complex 'a disaster waiting to happen', reinforcing concern over the structure of high-level active waste tanks in particular. Martin Forwood also considered the theme of radioactive contamination as he recalled that before the British Nuclear Fuels Limited (BNFL) bankruptcy in 2005, CORE used to

host their own local meetings and consultations on radioactive waste management. He went on to explain that following the Nuclear Decommissioning Authorities' (NDA) creation to clean up and decommission the Complex, the group thought 'the bad days were over', but it never happened that way and the NDA continued to support reprocessing. Thus, in Martin's opinion, the NDA have become a major waste producer and discharger in their own right as the income from the reprocessing operations help to cover the costs of site clean up. In this context, Martin described the role of the CORE as being to lobby for attention to reprocessing, which he understands is currently being overshadowed by new GDF developments and proposals for new reactors at Sellafield. Thus, in contemporary constructions of energy justice around the Sellafield site there was continued concern about the potential radioactive burden of the facilities.

Martin Forwood summarised these concerns as being fourfold as he went on to reflect on the themes of radioactive contamination, health, and safety and emergency planning around the processes at Sellafield:

1) The reprocessing operation creates 160x more nuclear waste than the storage and disposal of the original material,
2) Radioactive discharges to the environment, primarily from the Magnox reprocessing plant and to a lesser extent, THORP,
3) The health implications of discharges, and
4) The transport of nuclear waste, which he characterised as unnecessarily risky

The radioactive hazards outlined above were perceived to extend internationally by three respondents. Martin stated, for example, that whilst the impact of the site was primarily local, his work did engage with the national or international scale for the reason that radioactive discharges could be monitored along the UK coastline and as far abroad as Canada. This included concern about the radioactive contamination caused by uranium mining, as is explored in section 6.1.2.1. Jean McSorley explained

that Britain originally reprocessed spent fuel in order to separate plutonium for use in nuclear weapons. She gave the opinion that this justified later reprocessing activities on the grounds that the recovered plutonium would be used as a nuclear fuel in reactors. This, effectively, helped other countries justify their civil spent fuel reprocessing activities. Such programmes could, however, also be used as a disguise for countries to recover plutonium for military purposes. Civil reprocessing by some countries has, therefore, led to concerns over weapons proliferation by stealth. Consequently, Jean gave the opinion that herself and other nuclear specialists think the debate about the present-day reprocessing facilities at Sellafield is inherently linked, even if only in political terms, to militarisation and nuclear weapons proliferation and gave the green light to other countries to do so too, which has proliferation implications. Consequently, Jean perceived the debate about the present-day reprocessing facilities at Sellafield to be inherently linked to questions of militarisation and proliferation.

> *'What Sellafield will do ultimately with its plutonium stockpile will be a big international issue. It has never been anything but something that has had local, national and international implications'.*

For Jean, these international implications include the import of spent fuel from overseas. Jean explained that during the second consultation on the development of a GDF, which took place from 2008 to 2013:

> *'People would keep saying, "oh, but we have already got 97% of the waste at Sellafield" and, therefore, what followed from that was this whole "we should think about disposing of the waste here because of the risk of transport". But when you break down the figures, the vast majority of the radioactivity in the inventory that is at Sellafield has been shipped in from other areas of Britain and other countries. So what you are saying is that what is a national problem is now being very deviously turned in to a local issue'.*

NGO discourses also reflected on the theme of the cost of nuclear waste management. Anti-nuclear academic expert, Andy Blowers, stated that Sellafield absorbs about 80% of DECC's budget – which he estimated to be about £7 billion – in order to maintain legacy wastes. Yet despite the high expenditure, the facility was only 'passively safe' and conditions continue to degrade. This includes seagulls floating on cooling ponds and rusting cast iron boilers next to the cores. In line with these concerns, Pete Wilkinson added that 'we are spending billions every year on trying to deal with it, and I do not think we are getting very far'. Such concern over the price of management also transitioned into the decision to proceed with new build nuclear in the UK and the continued reprocessing of spent fuel, which will increase the volumes of radioactive waste that require management. In this regard, the costs of nuclear waste management were seen to directly coincide with concerns over the fourth theme, safety and emergency planning. Jill Sutcliffe relayed, for example, that she had discovered contradictions in statements about the methods for waste management, including information on waste casings that needed to simultaneously let gas out but not let water in. In this regard, she highlighted that nuclear waste is an extremely long-term issue, but that we have already seen short-term failures in waste management.

Yet despite the emergence of negative views towards the operations at Sellafield, Pete Wilkinson also acknowledged reluctant acceptance of the facility, based on the idea that if radioactive material was present it ultimately had to be dealt with:

> *'The legacy waste is here now; whatever created it, whatever stupid policies we went in for, created it. We have to do something with it; whether we continue to store it above ground or whether we think we can know about disposal to put it underground is neither here nor there'.*

Therefore, alongside opposition of the creation of new nuclear waste, there was acceptance of the continued role of the Sellafield facility in the care and maintenance of legacy materials.

In the present-day context, policy respondents offered more mixed evaluations of the Sellafield facility under three of the aforementioned distributional themes, (1) jobs and economic prosperity, (2) radioactive contamination, and (3) the cost of nuclear waste management, before referencing the continued need to address legacy nuclear wastes.

In contrast to the negative views outlined above, three policy respondents highlighted the contemporary benefits that Sellafield has for jobs and economic prosperity, thus highlighting the perceived distribution of benefits rather than ills. As an illustration, Hergen Haye highlighted that many of the local communities formed around the Sellafield site, including in the nearby areas of Allerdale and Copeland, due to the facility's positive impact on jobs and economic prosperity. In the case of Copeland in particular, he underlined that the site was something of a lifeline, and suggested that the local population might argue for Sellafield's expansion. Niall Riddell, an unattributed respondent, followed that 'they have had their problems up there, but realistically, the primary employer with any sort of financial backing around it is the Sellafield site and the associated working environment'. With this in mind, Niall also advocated the continued expansion of the site on the grounds that you could take advantage of the localised skills and populous communities that have built up in the area. Further, Bill Hamilton from the Nuclear Decommissioning Authority (NDA), which now has oversight of the operations at Sellafield, explained that the outcome of investment was that the wages around the site and in Copeland are the highest outside London.

Bill Hamilton went on to state that under the guidance of the Energy Act 2004, the NDA is required to recognise the socio-economic impact of closing nuclear sites.

According to Bill, the NDA seeks not only to recognise this, but also to deal with it, and as a consequence, has invested £50 million in ten years into the socio-economic future of West Cumbria. Investment includes the Energus centre in Lillyhall, between Whitehaven and Workington, which offers youths entry into the nuclear industry. Other opportunities include STEM subjects at school, the creation of apprentice opportunities, the funding of the Dalton Nuclear Faculty and further community projects. Thus, whilst NGO actors discussed the provision of jobs as having limited impact on local deprivation, characterising Sellafield as a facility that negatively dominated the job-market and prevented non-industry investment, policy actors perceived it as a positive site and a positive opportunity. These contrasting perspectives of the same theme, jobs and economic prosperity, serve to highlight differing conceptions of energy justice around the Sellafield site.

Alongside positive accounts of local impacts in terms of jobs and economic prosperity, the results also highlighted complexities within policy constructions of local acceptance and benefit. Policy respondents referenced, in particular, the idea that positive opinions of the site did not extend to a regional scale. Hergen Haye pointed towards wider Cumbria, including the Lake District, as a source of negative opinions, where the populace labelled the facility as a blight on the community, which could prevent tourism. At this scale, there was recognition of the negative impacts of construction and maintenance, and the potential disruption caused by site developments. Gregg Butler commented, for example, that 'if you are in your little puddle and all of a sudden you are going to have lots of lorries going through your village, which has not seen anything bigger than a milk float for the last 30 years, you are going to get annoyed'. He described contemporary concerns around housing for incoming workers; concerns based on the fact that around 4000 construction employees entered the local area during the construction of THORP and that as a result, 'places like Egremont became like the Wild West'. Gregg added:

'You know, when the councils voted to carry on or stop on the geological disposal facility, the district councils on the coast voted overwhelmingly in favour of going on, and Cumbria County Council, which of course, has got interests in Carlisle and Kendal and things, voted narrowly against it. So, there is a big fall off in support with distance, as you would expect really'.

Such discussions represented discursive tensions between geographical areas and as such, constructions of energy justice. Within such discussion about the spatial impact of the site, however, almost no mention was given to the European or global scale. In this regard, the justice issues presented here are locally or nationally based, in contrast to the international focus of NGO discourses outlined above.

Policy discourses also exposed present day concern over radioactive contamination. Gregg Butler distinguished between local and localised threats of contamination, the difference between a whole area and distinct pockets, for example. Gregg gave the example of one particular hot spot, Freckleton on the River Ribble, where the mud had been found to contain higher than average levels of radioactive particles, though he did criticise the calculation of radioactivity levels and question the health risks they presented. He went on to identify such radioactive contamination, or the so-called transferable detriment, as a primarily UK issue on the grounds that on a European or worldwide scale, the individual doses produced by Sellafield were the equivalent to natural radiation nanoseconds. He added, 'there is nothing Sellafield… I am being careful here... but certainly on the sort of pan-Irish Sea to world-scale, there is nothing Sellafield has ever emitted which would be detectable in an epidemiology'. Thus, whilst radioactive contamination was mentioned, it was perceived as being a primarily national issue. This was also the case for Representative One from Energy Company One, who characterised high level spent fuel and intermediate level waste as relatively low hazard when compared with toxic wastes produced by other non-nuclear processes, suggesting that, 'in the case of

radioactive waste, it does have a kind of emotional attachment to it and we over engineer it'.

Further concerns arose concerning the cost of nuclear waste management, adding discourses of affordability to contemporary energy justice articulations in addition to those around electricity affordability in the case of Hinkley Point C, as highlighted in chapter 5. To this end, Oliver Epsom estimated that around £17 billion was spent in 2014 cleaning up 'the sort of mess we have got at Cumbria'. Echoing such concerns, Representative Two from Energy Company One expressed the opinion that the cost of disposing of nuclear waste ought to be taken into account in the pricing of nuclear energy. He stated, 'if that means digging a very deep and safe hole and putting it there for many years, that should be included in the price. I think that the consumer has also got to realise that very little is free these days, especially in terms of waste'.

Despite the somewhat mixed opinions from policy representatives outlined above, and in line with NGO discourses, the operations at Sellafield were understood to be a necessity. Bill Hamilton from the NDA stated in this regard, that 'Sellafield has an on-going role in the UK's nuclear waste legacy'. With responsibility for the management of the interim storage of nuclear wastes, he explained that the NDA has identified Sellafield as the place it can be best stored, particularly high-level radioactive material and 'exotic material' from Dounreay.

Joel Kenrick closed that 'the ponds at Sellafield which are dealing with the new wastes are much better and more organised ponds than the ones that deal with the old waste', expressing the opinion that operations have improved. Yet Joel also explained that legacy wastes as Sellafield present an on-going concern and the historical management issues at Sellafield were still extant today:

> *'It is absolutely horrifying. I went there in 2011 and got a tour and the ponds, the open-air ponds, which have nuclear waste in them, have seagulls in them*

and are leaking. Then the new ones do look a lot better. The thing about Sellafield is that compared to the equivalent site in the US or elsewhere it is such a compact site, it is absolutely mad. You have got a couple of old nuclear reactors right beside your new waste storage place and then you have got a bunch of the old ponds that are all there, right beside the plutonium store'.

In this regard, whilst policy respondents recognised the benefits of the site, its historical legacy and the consistent concern about radioactive contamination at Sellafield still appeared as significant discourses.

6.1.1.3 Future Articulations

Alongside evaluative accounts of past and current distributional justice manifestations at the Sellafield site, interview discussions also addressed the future handling of nuclear waste, including the potential for a Geological Disposal Facility. Within such discussions, the interviewees touched upon the themes of facility maintenance, technological feasibility, connections with new build nuclear stations, uncertainty, and growth and development. In discussing these future scenarios, the interviews included insight into perceived future distributional justice concerns around nuclear waste management.

NGO respondents addressed three of the aforementioned themes, (1) facility maintenance, (2) technological feasibility, and (3) connections with new build nuclear stations. For NGO respondents, future distributional justice articulations included concerns around the processes of waste storage, disposal and reprocessing under the theme of facility maintenance. Andy Blowers expressed concern over the tendency to leave infrastructure standing, and not proceed with its decommissioning. He stated, to this end, that 'you can say it will stand there forever, but it is a bit like the pyramids, you know something will happen. And of course, the longer it is left the more difficult it is to deal with. We cannot deal with it now so we

have to leave it, but if we leave it then it will be harder to deal with, so it is a Catch 22 is it not?'. He continued that nobody knows exactly what the risks are as there are too many intervening variables. In this regard, Andy highlighted concerns over future accidents and discharges. Pete Wilkinson agreed, stating 'if ever anything does go wrong, particularly with the high active liquor, then we are in big trouble'. Pete Wilkinson went on to express concern that the eventual decommissioning of the facilities at Sellafield would create heightened discharges from the plant and as a result, elevated levels of radioactive contamination. In this regard, NGO respondents expressed concern over the uncertainties of future nuclear waste handling, as is effectively summarised by the following quote from Pete Roche, Press Officer for No 2 Nuclear Power:

> *'The people that want to bury the nuclear waste say "oh, we have got to sort this waste now because we do not want to leave it for future generations" but we say, "well there is no point in leaving future generations with a load of nuclear waste down a hole that is leaking into the surface environment, and you can not guarantee that that is not going to happen". So, you still end up with this sort of "tis", "tis not" argument. I think it has happened a bit with decommissioning nuclear power stations; you can either try to dismantle them as soon as they are shut by inventing lots of robotics, or, you can leave it for 60 to 100 years before you start chopping it up, and then the radioactivity inside is much less. But then you have got the dilemma of leaving it for people who have had nothing to do with it, that had no jobs, no electricity. They might get a job chopping it up but then their health is being impacted in the future. So, it is a dilemma but it is definitely something that needs to be dealt with'.*

Thus, within this quote Pete reflects on whether it is just to pass the distributional burdens of nuclear waste on to future generations who have not received any distributional benefits.

NGO respondents also questioned the technical feasibility of the GDF, as well as justifications of why it should be hosted in Cumbria. Andy Blowers identified, for example, that 'one of the great motivators of the GDF is that it provides a safe and secure solution forever and forever, actually, is an impossible concept'. Instead, Andy believed that there would be eventual leakage. Further, Pete Wilkinson noted in this vein that as over 90% of the radioactive burden in the country is at Sellafield, it creates an unbalanced debate about the siting of future repositories due to the potential logistics of moving the selected site. He closed, 'the thought of actually moving that stuff a long way away from where it is currently stored, beggars belief'. In this regard, the future of Sellafield was perceived as directly bound by its historical operations and the long lifespan of nuclear waste. Ruth Balogh also explored this idea. She explained that when talking about plans for a GDF, a leader of the Copeland Council had once suggested that there was an ethical duty to hold the GDF in Cumbria as they have the waste already, and have the responsibility to keep it safe. However, Ruth perceived this as an untruth as she explained that the contributing reactors were going to be outside Cumbria, mainly, and so the Leader was incorrect, as more waste would be coming from external sources. In essence, that the GDF would include waste from new reactors, not only material already held in Cumbria, thus voiding the leader's ethical stance.

NGO respondents also highlighted connections between nuclear waste management and new build nuclear power. Jill Sutcliffe explained that her current involvement in a campaign group opposing the development of Pressurised Water Reactors (PWRs) was due to concerns about continued development of nuclear power despite the fact there was no solution to the waste issue. Ruth Balogh developed this point in more detail as she stated that according to CoRWM, the search for a GDF should be taking place independently of new build nuclear as a means of disposing of legacy wastes only, but that in fact these decisions had gone hand-in-hand. Pete Wilkinson added that 'we have an obligation to … take on those ethical dimensions of the problem. To go into a new build program without knowing what you are going to do with this

highly radioactive waste, which remains dangerous for a very, very long period of time, which affects future generations, it is irresponsible in the extreme'.

In addition, and going beyond material impacts, Martin Forwood suggested that with reprocessing set to end by 2020, the campaign group Cumbrians Opposed to Radioactive Environment may also cease operation, as their main campaign point ceases to exist. Instead, Martin believed that other groups would cover the issues they do not, as well as new developments. In this regard, the changing role of the plant through time had a direct effect on the perceived injustices stemming from the site, and therefore on the NGO campaigns being held against it. Pete Wilkinson reinforced this view by stating that 'the object of the exercise as far as in government and the industry is concerned, is to create such a momentum to convince people it is going to happen and to make sure that there is support generated from the communities by talking about jobs and talking about infrastructure and how it is all going to be wonderful for the area. The fact is that it is going to change this area, change the character of this area, forever'. Thus, the focus of his work was to go into outlying areas – away from the plant itself where he perceived that support was high – to talk about what the response would be in the event of an offsite release of radioactivity, akin to those from Fukushima. In debates about the future of nuclear waste, then, Pete wanted to reach the people who did not give it too much thought.

When considering future distributional justice manifestations, policy respondents offered more mixed evaluations of the Sellafield facility under three of the aforementioned distributional themes, (1) technological feasibility, (2) uncertainty and (3) growth and development.

Steve Thomas, Professor of Energy Policy at the University of Greenwich, expressed concern about the technical feasibility of the GDF, including where we store intermediate level waste in the interim, the lack of robotic technology needed to handle waste within the facility and fundamentally, the cost of the procedure. As an

additional example, Gregg Butler highlighted that the eventual closure of THORP and the decommissioning and clean-up operations of the facilities presented increased risk of non-negligible radioactive discharges:

> *'Yes, and this is one of the straight trade offs between the good of commerce and the bad of discharges in that they have not had any new spent fuel to reprocess in for a while and that is so they will essentially finish doing their backorders in 2018. At that point, there will be 2000 people with no jobs. It will not work quite like that, but I mean there are 2000 people in THORP and associated plants now, and once they have finished, they will essentially become redundant'.*

In addition, Gregg Butler warned of excess conservatism around radioactive discharge, where too much focus on finding new mechanisms to prevent them could delay decommissioning; he added, 'at the ultimate level, you cannot store things forever and you cannot keep up societal control forever, so if you keep delaying you have got to say, well, what is the end point of my continued delay? The end point of my continued delay is a loss of control and the lot falling over'. Discussions included potential pollution from the Magnox reprocessing facilities, on-going potential from the THORP facility, and discharges from the wider site clean-up operation. Lynda Warren echoed such sentiments as she explained that 'we should do the best we are doing now, not go with a "what if" based on every possible problem in the future. In the meantime, people could die of something else'.

Two policy respondents also shared concerns about future uncertainty. Representative Two from Energy Company One expressed the view that,

> *'I think the government's position of saying well, I am not quite sure when it is going to be ready so you have got to design your power station to be able to accommodate this waste until 20, 30, 40, 50 years or whatever. It is a little bit of*

a concern because it adds an air of ambiguity, it adds an air of uncertainty and people do not like uncertainty. It would be really nice if the government could say "okay, the repository will not be ready in 2020, it will not be ready in 2025, but we can guarantee it will be ready in 2030, or even 2040". But saying, "well, we are not quite sure" it does not help us and it is an issue we have got to manage. So as I have said, we have got to manage it very, very securely, very safely and all those sorts of issues'.

In agreement with NGO discourses, then, policy respondents were also concerned about the uncertainties of future radioactive waste management, and the potential for accidents and radioactive contamination. Despite the appearance of concerns, however, three respondents also reflected positively on our future capacity to deal with nuclear waste issues. Hergen Haye believes, for example, that the industry has now learnt to build nuclear power stations with decommissioning in mind, and have far more clarity about what is in waste storage ponds, flasks or silos, therefore ensuring that future waste handling will be much more predictable. Further, Joel Kenrick explained that given that the waste exists and has to be dealt with, the real question was, ultimately, whether it is better to ship that to Sellafield where we know what is happening and deal with it there, or whether it better to store is somewhere, which may be less safe, or to deal with it in another way? Joel added:

'In a way I think this comes back to one fundamental issue of nuclear, which is that, I would not have started here but now I am here what do I do? And that is the problem really. We might not have wanted to have this waste in the first place, but now we do, what do we do with it? If you have got somewhere to deal with it and they have got excess capacity then why not deal with other people's waste as well? I do not see any moral objections to that'.

For Hergen Haye, the role of Sellafield also extended beyond waste and disposal to continuing the reprocessing of nuclear waste and developing a plutonium disposition

route, which could handle overseas waste from Korea and Japan, for example. His argument was contingent upon the creation of plutonium disposition facilities as he perceived it to be ‘a disgrace that we are sitting on 140 tonnes of plutonium, the largest stockpile anywhere in the world, and on financial terms we are not willing to move on that one. Because we do not move on that one we cannot reprocess any more and because you do not do that, you are basically losing your nuclear fuel cycle capability’. Hergen Haye’s encouragement for expansion of the operations at Sellafield sat alongside statements from Bill Hamilton who explained that further investment in non-nuclear endeavours included the dredging of Workington Harbour so that it can take larger ships. Bill added that in his opinion, all funding is designed with the transition to a sustainable future in mind.

In contrast, Lynda Warren believed that the GDF option was safer, and that the construction of a GDF was no more challenging than a petrochemical plant. She added that whilst she anticipates unpopularity during the construction and waste transport phases due to noise and the high number of workers, the complaints would not be due to its radioactivity. Instead, they will emerge because it is a major infrastructural investment. Lynda had faith, then, that the GDF would be inert. She explained that a positive of the GDF is that it would not allow for people to do things differently. Lynda added that if something went wrong at the Dounreay facility, it could result in an immediate injury or dose of radiation for a worker, as well as a delay in decommissioning, whereas if the same thing were to happen with the GDF, it would take thousands of years for the hazard to return to the surface.

In closing, both NGO and policy respondents reflected on the uncertainty of future nuclear waste handling, whether it is held at the surface or stored in a GDF.

6.1.1.4 Summary of Distributional Articulations

Alongside a high level of evaluative detail, the results above provide three main insights into a complex set of discourses around the Sellafield Nuclear Complex in Cumbria. They have demonstrated, firstly, that distributional justice articulations vary through time. The results show clear changes in historical management practices on the perceived threat of radioactive contamination, the influence of current site handling and new discourses around the possibility of a Geological Disposal Facility, for example. In this regard, distributional justice manifestations vary according to the life cycle stage and processes within a site. Given that Sellafield was the first nuclear site in the UK and that it has been criticised for a surrounding lack of understanding and regulation compared to later sites, it is reasonable to assume, too, that the distributional justice outcomes are also an outcome of the timing of its development, and the ensuing mistakes and instances of poor practice.

Secondly, the results demonstrate both variation and consistency in the distributional justice articulations according to actor in question, thus moving past typical pro-nuclear and anti-nuclear divides. In many instances, NGO respondents focussed on occurrences of 'injustices', points at which the site was perceived as negatively affecting the local area, whereas policy groups focused positively on the provision of 'justice' in terms of local benefits. However, the results also demonstrated united concerns over management practices and radioactive contamination. Thus, in the case of policy respondents, they demonstrate attention to 'non-nuclear', the promotion of jobs and economic development, for example, and more negatively perceived nuclear elements in terms of cost and radioactivity.

Finally, the results demonstrated that in many cases, waste storage, reprocessing and disposal at Sellafield was perceived to be intimately linked with other stages of the nuclear system, including energy production and military uranium production, strengthening the case for whole-systems approaches to energy governance.

Summaries of the core themes emerging from the distributional articulations across time are presented in table 6.2.

Time	NGO	Policy
Past	• Radioactive contamination • Health • Military usages	• Radioactive contamination • Military usages • Jobs and economic prosperity
Present	• Jobs and economic prosperity • Radioactive contamination • The cost of nuclear waste management • Safety and emergency planning	• Jobs and economic prosperity • Radioactive contamination • The cost of nuclear waste management
Future	• Facility maintenance • Technological feasibility • Connections with new nuclear stations	• Facility maintenance • Uncertainty • Growth and development

Table 6.2 Summary of Distribution Results by Sample Group

6.1.2 Justice as Recognition

Across the two case studies, the Hinkley Point Nuclear Complex and the Sellafield Nuclear Complex, 13 justice as recognition themes emerged from the interview discussions. In the Sellafield case, this included concern for populations affected by radioactive discharges, future generations, uranium miners, local communities, taxpayers and volunteer host communities for the GDF as specific groups of concern. Each of these groups is discussed here. Across the two sample groups the results show that, on the whole, both NGO and policy respondents were concerned with those negatively affected by the facility. These findings are explored throughout the following paragraphs.

As with the Hinkley Point Nuclear Complex case study, the results of the interviews gave insight into the questions of not only 'justice for whom?' but also 'justice *by* whom?', the two headings used throughout this section. By considering the question of 'justice by whom?', the interview respondents highlighted who is perceived to be responsible for remediating injustices, or conversely, ensuring the continuation of just practices. In discussing this idea of responsibility the respondents advanced the typical application of justice as recognition, which, generally speaking, has focused on the recipient of benefits or ills only, not those who create them – an aspect of justice that is very pronounced in climate justice debates. In terms of attributing responsibility, both groups identified that government and industry were ultimately responsible for nuclear waste storage, disposal and reprocessing operations. Illustrative examples are provided in the following paragraphs. Throughout, the results are presented firstly from NGO respondents and secondly from policy respondents in order to highlight contrast between their given perspectives.

6.1.2.1 Justice for Whom?

Throughout the interviews, NGO respondents recognised three main social groups: (1) populations affected by radioactive discharges, (2) future generations, and (3) uranium miners. In so doing they demonstrated variations in their 'justice as recognition' discourses according to analytical themes of time and systems component. As with the results from the distributional justice articulations, NGO respondents focussed on occurrences of 'injustices', groups that were negatively affected by the operations at Sellafield.

Speaking to the first theme, populations affected by radioactive discharges, Martin Forwood highlighted concern over the potential occurrence of childhood leukaemia in and around Seascale, the nearest village to the Sellafield facility. He drew attention to the 1980s Black Report, which concluded that radiation was a known cause of leukaemia, and stressed that the industry denies the connection between the site and

the illness. CORE's concern extended to local workers too and Martin referenced a 1991 report, which suggested that workers who were exposed to radiation before they conceived children could pass on genetic damage. Jill Sutcliffe echoed such concerns as she explained that whilst research in around 1956 demonstrated that radioactivity could cause instability and cell mutation within consecutive genetic groups, no major investigative work was undertaken. In this regard, Jill focused on communities that have been affected by radioactive contamination, but have not always been able to prove its connection or effect, the 'down wind-ers'. Jill went on to identify the 'sweet and sour effect', workers who have a vested interest in the Sellafield complex due to their jobs and working and family relationships, but who face negative health outcomes as a consequence of their involvement. Within these examples, both Martin and Jill expressed concern for both those facing contemporary health impacts, as well as for future generations via the health impacts of radiation and the potential for genetic mutation in successive cohorts.

Alongside the potential for health impacts on future generations, Jill Sutcliffe also highlighted the potential for inter-generational information deficits, contributing to the development of the future generations theme. In this example, Jill suggested that information on how the Windscale fire, Chernobyl and Fukushima disasters could be avoided, controlled or contained is not being passed on.

Although future generations were recognised as an important group by all NGO respondents, Pete Wilkinson also stated that he has never been part of a discussion on how to recognise them and that he does not think he can be, as 'it is too far ahead and people cannot really get their heads around justice or equity for future generations in this sort of debate'. Therefore, he considered that whilst there was a need to recognise them in theory, it was harder to do so in practice. In contrast, Andy Blowers developed a positive example of their recognition through his work with CoRWM. Andy was responsible for orchestrating a debate on the ethical issues of nuclear waste management, which he explained primarily concerned inter-

generational equity. His view was that the nuclear industry had been highly sensitive to the idea of inter-generational responsibility via the idea of stewardship, and that it is this principle that underlies the drive towards a GDF. Thus, Andy framed the GDF as a future-generation-sensitive waste management option.

Finally, NGO discourses also reflected the need to recognise the role of uranium miners and to offer compensation over the disadvantages they face as a result of toxic operations. Jill Sutcliffe highlighted, for example, that the UK's only uranium mine, South Terras near St Stephen's in Cornwall, was closed in approximately 1906, as it was not deemed to be viable. Instead, the international shipment of uranium for UK nuclear reactors comes from countries including Canada and South Africa, creating 'a blind spot' that the industry takes for granted. For Jill this included the failure of the UK's nuclear justification process – a European Union regulation which requires companies building nuclear facilities to demonstrate that the benefits outweigh the potential health risks – to acknowledge uranium miners, despite them bearing the highest radioactive burden in the nuclear lifecycle due to the widespread impact of uranium tailings and radioactive dusts. Andy Blowers, who also argued that the costs of dealing with the uranium mining should be included in energy pricing, shared Jill's concerns. Further, Ruth Balogh added that as some of the waste held at Sellafield belongs to Germany and Japan, the question of nuclear waste management becomes both a local and international issue. As a consequence, Pete Wilkinson considered that discussions about whether to compensate potential host communities for holding GDF opens the debate as to whether compensation is also due to communities that host radioactive waste today, whether from the front or back end of the nuclear lifecycle.

Throughout the interviews, policy representatives also reflected on the question of 'justice for whom?', identifying: (1) local communities, (2) populations affected by radioactive discharges, (2) future generations, (3) tax payers and (4) volunteer host communities for the GDF as specific groups of concern. Thus, as well as two distinct

groups of their own, policy respondents shared two groups of concern with the NGO discourses presented above – populations affected by radioactive discharges and future generations – and they continued the articulation of justice as recognition as concern for those negatively affected by the operations at Sellafield.

When speaking to the first theme, local communities, Bill Hamilton (NDA) split his answer into two separate responsibilities. Firstly, he stated a need for the NDA to ensure that 'the local community was suitably recognised and recompensed for the role it has played in firstly, the nuclear deterrent, and secondly, in producing electricity'. For Bill, this included acknowledgement of the WAGR and Calder Hall facilities as recognition of the local community's role in keeping the lights on, and of the wider contribution of the area to the UK economy. Secondly, in anticipation of the eventual run down and closure of Sellafield, and as recognition of the socio-economic role the facility has locally, he stated the need to include support for the communities undergoing future transitions. This included acknowledging the individuals who form part of the approximately 10,000 permanent and 2000 contracted jobs from a widespread set of communities in Cumbria. In summary, his articulation of recognition was two-fold, (1) recognising the role of the site in the UK economy and (2) recognising the role of the local communities in the site. Bill's second point referenced positive opinions on Sellafield's contribution to the local area, as supported by assertions from Hergen Haye and Niall Riddell in section 6.1.1.2.

However, four respondents also reflected on controversy when it came to identifying the 'local' community. Niall Riddell suggested that within the Lake District in Cumbria, you tended to find relatively affluent communities, whereas the wider area of Cumbria, including Maryport down to Sellafield, was relatively disadvantaged because all industry apart from Sellafield had gone. For Gregg Butler, of the 10,000 workers at Sellafield he identified that some are incomers that are there for the job and go home at the weekend, but that the majority are resident in the area. Yet

despite the high percentage of local workforce, he went on to describe that there was also opposition to Sellafield: those who 'really, really want it to go away and will march to try and prevent it, and mainly with fairly short term aims like, "you bastards are not coming to build a repository under my village" –Gosforth amongst other places'. Given the existence of such differences, Bill Hamilton stated that there was some controversy around which groups to recognise. This included tensions between Copeland and Allerdale over the placement of the Energus Centre in Lilyhall, which lies 100m within Copeland, and therefore is not perceived to be of benefit to Allerdale residents. Further, he went on to reference complaints from the local community that investment has created 'haves' and 'have nots', and to acknowledge that despite investment, pockets of deprivation remain. In this regard, policy respondents problematised social engagement and categorisation.

Bill Hamilton went on to express that whilst they do give some funding, including sponsored apprenticeships, he emphasised too that the NDA was not a community development body. He stated shortly, 'that is not my job'. According to Bill, the NDA's solution to defining local communities is therefore to deal with government bodies only – including formal, elected representatives within the district and county councils. Lynda Warren went on to explain a different approach taken throughout the government's Managing Radioactive Waste Safely (MRWS) process, which also included explorations of the definition of local communities in a bid to aid the siting of the GDF. Speaking as one of the members of the CoRWM committee tasked with this challenge, she explained that the outcome was that they 'simply did not know'. Thus, the government's answer is that there is a range of things that are in some way representative of the population. For this theme there was recognition that the local community was not a homogenous group and that it was hard to define, with down-the-line implications for consultation processes.

In relation to the second theme, populations affected by radioactive discharges, the results from the interviews demonstrate that the answer to the question 'justice for

whom?' was, at times, consistent across both sample groups. By way of an example, Gregg Butler introduced the concept of Critical Groups and Critical Group Dose – the exposure of certain societal groups to harmful quantities of radiation. He introduced this as a localised phenomenon where particular members of the population had been identified as being at risk, including those living on houseboats around Freckleton Creek on the River Ribble, and fisherman around a nearby landfill site, Clifton Marsh, who may have been eating contaminated flounders. Despite expressing some doubt over the realities of the risks these groups actually faced, his example reflected the reoccurring theme of radiological risk and highlighted potentially vulnerable groups.

In agreement with NGO discourses once again, policy respondents also referenced future generations. Gregg Butler highlighted his belief that 'we will protect future generations as much as we protect our current one'. He went on to describe the 'conservative' exposure levels that are currently worked to within plant operations, which he stated 'is enshrined and is worked to', adding 'I think we are protecting future generations with nuclear to an extent unthinkable from any other industry'.

Within this construction of 'justice for whom?' there were two groups of concern: (1) those exposed to radiation and (2) the future generations of affected peoples, whether they too are exposed or are genetically damaged. Hergen Haye extended this concern for future generations past those affected by radiation to include society in general, 'if you talk about inter-generational then we should also think about building a society, for example, where climate change is taken seriously. That is as much building for future generations as determining what energy mix we have today and therefore what liabilities we may have to transfer into the future. So you have to weigh both of them up'. However, in line with NGO representative Pete Wilkinson, Lynda Warren highlighted that in her opinion whilst the issue of radioactive waste does raise questions of inter-generational equity, there is no correct way to deal with it. Instead, she stated that it is a value-based judgement

based on where we are, and is combined with an understanding that the risks are a lot less if we make decisions now. Thus, again, the recognition of future generations in practice was problematised.

For Robert Armour of Smarter Grid Solutions Ltd, the stakeholder of concern was more widely defined. He included attention to the third and fourth theme, those that subsidise the facility through their taxes, and those that are faced with the siting of a GDF to deal with existing nuclear wastes, which many communities are reluctant to host. He stated in relation to the last group that, 'at that point the democratic line that says the rights of the individual must be protected, I think has to be tempered with the collective rights of the majority'. In sum, he gave his opinion that one community has to take the GDF for the benefit of the rest of the population.

Overall these results demonstrate that across both actor groups, and within policy discourses in particular, there is no one group of concern, rather a range of groups. Moreover, some groups were more easily identified and defined than others.

6.1.2.2 Justice by Whom?

In addition to considering the question of 'justice for whom?', interview respondents also highlighted who they perceived to be responsible for energy justice, albeit more briefly. Consequently, the results advance the energy justice literature to question who is responsible for the inequity and/or its remediation. The results reflect on both evaluative and normative examinations as respondents considered (1) who *is* responsible (evaluative) and (2) who *ought to be* responsible (normative). Further, respondents reflected both on their own responsibilities and on those of others, acknowledging, therefore, that all groups represented in this research study – NGOs and policy – are involved in both the production and continuation of energy justice. Evidence supporting this assertion is given below. Throughout, the results are presented firstly from NGO respondents and secondly from policy respondents in

order to highlight contrast, or more pertinently in this case the similarities, between their given perspectives.

Firstly, from an NGO perspective, Jill Sutcliffe highlighted that who is responsible for ensuring the provision of energy justice varies according to the stage of the nuclear system in question. This included input from policy oversight groups such as DECC, the ONR, the Department of Business, the Health Services Commissioner, and the Nuclear Installations Inspectorate. She identified that the number of different bodies who have some oversight was an issue in its own right, and that if you include all of the people, departments, companies, and regulators who are technically responsible for the oversight of nuclear power, members of the public are weighed down by an edifice of stakeholders involved, at all systems stages. She closed that this added to engagement challenges. Further reflecting on the perceived role of regulators, Martin Forwood returned to his concern for the genetic damage to workers caused by radiation exposure, and blamed a weak trade union at Sellafield for not properly protecting the health of its workers.

Discussing the siting process and CoRWM's involvement in the search for a GDF site, Andy Blowers stated that the search had to be based on a process of volunteerism and partnership, 'deliberative democracy, openness, transparency, all those kinds of things. All these good buzzwords that we had in the late nineties and early 2000; but it is not quite as simple as that, because the decision ultimately, is one that is taken by the Secretary of State on the basis of what the infrastructure planning people say. It is not actually within the remit of the local people'. Andy Blowers went on to explain that Britain is highly centralised and as a result, the local government's role is weak. In the case of nuclear, this means it has a consultative role but not a decision-making role, 'I mean the English system is powerless. It is completely bust. Centrally, yes, ultimate power does lie with the Secretary of State in Westminster'. Thus, again, Andy placed emphasis on policy respondents for energy-decision making although, in contrast to Jill this meant one person rather than a number of groups.

In slight contrast to Andy Blowers' perspective, Ruth Balogh did highlight a role for local government, although not a positive one. Reflecting her opinion that it was difficult to have any voice in consultations, she stated that the Allerdale constituency was lucky to have a very good MP who could get parliamentary questions answered. In contrast Ruth believes that the Copeland MPs were pro-nuclear and as a result, were not open to hearing her perspectives. She added that 'the MP for Copeland once threatened to issue a writ against me because of an article I wrote in the New Statesman about Sellafield'. Ruth added, however, that she is specifically trying to influence the government and the regulators because they are formulating policy, and she believes that within that policy, you have got to involve people from the outset or it is not going to work. She explained her view that it you are not interested in the dialectic, the dialectic will be interested in you. In this example, Ruth attributed responsibility for due process to the government in particular.

Jo Smolton, who covered the issue of nuclear waste treatment as part of her campaign role for Stop Hinkley, stressed the dangers of not identifying who is responsible. She said, for example, that 'all you hear about the waste story is "oh well, there is going to be a GDF", "oh well, it is going to be dealt with, somebody is going to do something with it sometime and it will be fine" and "oh, we are assured", and the guy who is assuring is not going to be around. How ethical is that?'. In this regard, Jo considered the ethics of decision-making now for future generations. Thus, she made clear that these decisions had to have an inbuilt accountability.

Policy respondents also reflected on who is responsible for energy justice in their discourses. Representative Four from Energy Company One stressed that if you are the current operator of a facility and therefore the producer of waste, you have a moral and legal responsibility to ensure that it is safely stored and safely disposed of. Acknowledging that as an industry body they cannot make the Geological Disposal Facility happen, 'we manage what we do have in the interim storage that we have

[and] we work hard to ensure that we are working on the waste hierarchy to minimise what has to go into that long-term storage in the first place'.

Niall Riddell, an unattributed respondent stated in this regard that:

> *'We are going to be building a new nuclear asset and we want to be very successful at that. Therefore we should also probably be positioning ourselves to be the leader in decommissioning and managing the legacy wastes. With that comes the responsibility for the fact that we have employed 900,000 people directly within each of the power stations, which are often in remote locations and they in turn employ a whole bunch of local services and skilled workers within that area. If we want to have a true legacy with those assets then we should make sure that we are managing the life-cycle of those assets fully and ensure that we are providing jobs and opportunities for the people on those sites in the future, and managing responsibly the assets that we have built there. So yes, I think the answer to that is we do build in some of our strategy and some of our thinking, particularly around nuclear assets, because they obviously have this much longer life cycle'.*

Representative One from Energy Company One shared the opinion that the responsibility for managing nuclear waste whilst its in interim storage lay with the energy companies and that they ought to pay for it. However, they also added that in terms of policy and the provision of a national GDF responsibility, that rests with the government.

Lynda Warren offered more critical reflections around who is currently responsible, and their successes in providing energy justice. She stated, for example, that 'right now, the government and civil servants are scared and frightened of putting a foot wrong. They are paralysed and do not want to be seen as persuading people'. Further, she believed that although the decision was made to make the NDA and the

Radioactive Waste Management Advisory Committee (RWMAC) responsible for nuclear waste decision-making she is doubtful they could do it. Lynda added that 'a lot of experience form the NIREX days has led to issues around transparency and distrust, and now the people leading the charge are scientists with no experience of working with communities'.

Finally, in contrast to Jill Sutcliffe's statement above, Gregg Butler gave his opinion that the stakeholders involved in nuclear are very limited if you use the term stakeholders in the sense of people who have views and are willing to express them, rather than ought to have views and ought to be willing to express them. In this regard, he thought those that were engaged either come from the 'plus two sigma box, who think it is absolutely bloody wonderful because "my lads work there"', or those in the 'minus two sigma box that think it is absolutely bloody dreadful and ought to be shut'. For Gregg, then, there was a belief that more people ought to be engaged than were.

6.1.2.3 Summary of Justice as Recognition Articulations

The results presented above provide a series of insights into justice as recognition in practice as they relate to the Sellafield Nuclear Complex. Firstly, they demonstrate that calls for justice as recognition vary according to the sample group in question. In this regard, operations at Sellafield were not perceived to be to the benefit or burden of any one particular social group, but in the case of this research, 13 groups. As outlined above, this included populations affected by radioactive discharges, future generations, uranium miners, local communities, populations affected by radioactive discharges, future generations, tax payers and volunteer host communities for the GDF as specific groups of concern. Throughout, these discourses addressed both who currently 'is' in focus and also who 'ought' to be, reflecting both evaluative and normative accounts of energy justice.

Secondly, the results have given insight into not only who justice is for, but also who is responsible for it, therefore attributing responsibility. They demonstrate that whilst all groups represented – NGOs and policy (including the academic experts and industry representatives that are subsumed within this second category) – are involved in both the production and continuation of energy justice, industry and policy respondents are assumed to have a higher *degree* of responsibility. Within this framework, they are the providers of energy justice, and the NGOs the assessors. Respondents reflected both on their own responsibilities too, acknowledging, therefore, that all groups represented in this research study have a role to play in both production and continuation of energy justice. A summary of these findings is provided in table 6.3.

Question	**NGO**	**Policy**
Justice for whom?	• Populations affected by radioactive discharges • Future generations • Uranium miners	• Local communities • Populations affected by radioactive discharges • Future generations • Tax payers • Volunteer host communities for the GDF
Justice by whom?	• Industry • Policy	• Industry • Policy

Table 6.3 Summary of Justice as Recognition Results by Sample Group and Question

6.1.3 Procedural Justice

Throughout the interviews, all respondents referenced and evaluated a range of procedural mechanisms through which decisions about the Sellafield Complex were made. The mechanisms mentioned included the following stakeholder engagement

and consultative exercises, which took place at the local, national and international scale:

- The NIREX Inquiry into a GDF (1995-1996)
- CoRWM Consultations (Stage One: 2003-2006)
- DECC Managing Radioactive Waste Safely consultation (2009-2013)
- Drop-in Sessions (intermittent)
- Local Site Stakeholder Groups (quarterly)
- DECC NGO Forums (beginning September 2010, occurring semi-annually)
- NDA consultations (beginning 2010, occurring intermittently)

For NGOs these discussions primarily took the form of critiques of their experiences of procedural engagement, including concerns over the exclusion of individuals and groups from the proceedings, when consultations took place, and the transparency and truthfulness of consultations. However, in addition to these critiques, four respondents also drew on positive experiences, offering insight into perceived 'just' processes. Policy respondents gave more mixed evaluations, reporting on both successful procedural mechanisms and areas of future development; within these discussions policy respondents appeared critical and open to alternatives. In the case of discussions around the potential for a GDF, this was taken as reflecting the role of the interviewees in an on-going and uncertain process.

In addition to describing current and past procedural mechanisms, respondents also described potential improvements to the procedural systems, providing normative insight into how procedural justice might materialise. Section 6.1.3.1 introduces the evaluative constructions before section 6.1.3.2 discusses normative constructions. Throughout, the results are presented firstly from NGO respondents and secondly from policy respondents in order to highlight contrast between their given perspectives.

6.1.3.1 Evaluation of Procedural Mechanisms

For NGO respondents evaluating past and current procedural mechanisms, the primary focus was on their legitimacy. These discussions largely took the form of negative reflections on their experiences of procedural engagement, including concerns over (1) the exclusion of individuals and groups from the proceedings, (2) consultation timings, and (3) the transparency and truthfulness of consultations. Each of these themes is discussed here before a consideration of policy articulations.

As an example of the first theme, the exclusion of individuals and groups from procedural engagements, Ruth Balogh reflected on her experiences with the MRWS process for identifying a GDF. Within this, she said that local councils had to be persuaded by the government that NGOs should be included in the decision-making process, and that 'they regard us as the enemy'. She added that 'what you have to understand about the way the nuclear industry operates around here is that anything it is involved in will not tolerate dissent':

> *'What is really awful about this situation here is there is a lot of people do it themselves for the authorities – they say, "oh I do not think I can have you meet in our village hall" you know, "we better not let you have space in the hall because you might say something against the nuclear industry". So what? So a lot of people just presume that is the dominant discourse and that is how it has to be and they have to be part of implementing the dominant discourse, and that really gets me a bit cross!'.*

This is despite Ruth's opinion that some positive changes have been made as the process is at least being rehearsed in the open; the difficulties have shifted as she stated that now 'you may have a voice, but do you get listened to? Probably not'. Thus, Ruth concluded that despite positive advancements further steps were required.

Martin Forwood also reflected on the recognition of his own NGO group and its role in the decision-making process. Martin stated that CORE 'experienced verbal and physical rough handling from the outset', including vandalism to cars that had an anti-nuclear sticker in the window. Further, at the local stakeholder meetings held around Sellafield, CORE was often the only opposition group and therefore, 'the black sheep'. Indeed, Martin recalled that the meeting groups are primarily formed of Sellafield workers and union members with very opposing views to those of CORE. They argued in favour of reprocessing operations and against the GDF on the understanding that it put the nuclear waste resource underground. Martin perceived that the local authority members held the same position, including in particular the Copeland Council, which houses Sellafield. He added that they have 'historically rubber stamped everything that Sellafield has done and have brought Allerdale along too'.

Martin also spoke to his experiences of consultations for the GDF, the first of which was the NIREX Planning Inquiry in the mid-1990s, within which Cumbria County Council voted against the GDF on the grounds of insufficient investigatory work and poor information disclosure. The MRWS process which, according to Ruth Balogh was the most in-depth consultation that has ever taken place in the UK, was later initiated by DECC and took place between 2009 and 2013. The final decision of the MRWS process was presented in January 2013. Within, plans for a GDF were approved by the Copeland and Allerdale areas but vetoed at the higher Cumbria County Council level. Martin explained that if the consultations do not find a suitable site now, the government would select one, a process that he perceives to be unfair. He spoke to an alleged nuclear bias in the government in DECC, which, in his opinion, is leaving local groups disenfranchised. Ruth Balogh also reflected on the complexity of these decision-making processes as she explained that whilst Allerdale and Copeland are next door to each other, Cumbria County Council acts as an overarching entity, meaning that every consultation must be accessed by each group. Further, taking a wider lens, Andy Blowers questioned the local vs. national divide as he stated 'do you

allow the centre of your activities to have a kind of ultimate veto, or is it the wider area? I mean, the point is you will never get anywhere with finding a site for nuclear waste because there is always something that is going to… I mean, I am still struggling with others in government to try and see a way forward'.

Such legitimacy concerns also extended to the role of the organisations involved in nuclear oversight more generally. As one example, Pete Roche, reported that whilst the Committee or Radioactive Waste Management were initially one of the most forward thinking public consultation bodies, the government 'just ignored a lot of their recommendations and sacked all the good members of the committee'. Thus, Pete gave the opinion that not only NGOs were excluded, but policy bodies were too. Indeed, considerations of the first theme, the exclusion of individuals and groups from procedural engagements, extended to the issue of scale more overtly as Andy Blowers questioned which level was most appropriate for decision-making:

> *'I think people will always say they were excluded, but how can you say they were excluded in the Cumbrian situation when the reason it did not proceed was because Cumbria County Council voted not to proceed? That represented a very wide area. I would say in one sense it was very widespread, not including everybody obviously, but there were all sorts of techniques we used, and on the other hand you could say it was too narrow because it did not home in enough on the areas that really cared, and this is always going to be the problem'.*

On the second theme, consultation timings, Ruth Balogh also referred to her experiences of the 2008 MRWS consultation on the potential siting of a GDF, which she thinks 'compromised the process for the future'. Ruth gave the opinion that the local councils colluded in favour of being the host communities for the GDF as, two weeks after the 2008 White Paper on Managing Radioactive Waste Safely was issued, Copeland Council had already expressed an interest in hosting the facility without consulting the local population. Ruth went on to explain that in contrast, Allerdale

Council did do some consultation, as did the Cumbria County Council. According to Ruth, however, after Copeland came forward no one else needed to volunteer and the process became immediately compromised, despite the fact that the area was not geologically suitable. She added in relations to the MRWS consultation, 'I do not think anybody is going to take it seriously now, because it was so poorly designed'. In this regard Ruth highlighted her belief that the order of the decision-making process was incorrect and as an outcome, damaging for future consolations.

Reflecting on the order of process, Martin Forwood went on to state that he no longer gives long responses to the consultations because he knows that they will not be read. Martin added:

> *'At public consolations held by the NDA and DECC you always get the feeling that they are consulting after a decision has been made and because they have to'.*

Pete Wilkinson, who questioned the ability to inform government policy, shared these views:

> *'You can talk about all the issues that arise form the policy but you cannot question the policy. The policy has been set and no matter who you speak to, whether it is ONR, NDA or the Environment Agency or whoever else, they will say, "we will talk about anything you want but we can not talk about policy because policy's set by government". So, you know, you have got this very neat situation where the policy is set in what I consider to be a totally undemocratic way and once the policy is set, it is untouchable'.*

Pete added that whilst the regulator's – the NDA and ONR's – job is to look after safety and security, he got the impression that the assessment processes that they go through are very routine, and that their overriding desire is to make sure that

they enable the policy to go through. Within this, he questioned the legitimacy of claims that the radioactive waste management plans for new nuclear are in place, adding, 'it might be there on paper what they want to do, but how they can actually put that into operation is a million miles away because we do not even have a host community yet'. Referencing the Nuclear Waste Advisory Associates, who posed a series of issues and questions about disposal, he went on to state that 'none of the backend issues to do with radioactive waste have been resolved, yet minsters still say that the situation is sufficiently stable for them to go ahead with a minimum of ten GW of new build. I mean the whole thing is absolutely crazy, absolutely ridiculous'.

Finally, Ruth Balogh focused on the overlaps of energy production and nuclear waste handling. Ruth explained that according to CoRWM's commentary during the MRWS consultation, the search for a GDF should take place independently of discussions around new build nuclear because there is a large stockpile of waste that already needs to be handled. She stated that solving the waste dilemma should be resolved before any new build plants are build, but:

> *'That is completely thrown out of the window, you know, the government's not interested in that. What it wants is a solution to the existing problem of waste in order to support its new build programme, so they went hand-in-hand. So there you have got a justice issue that was compromised from the outset, and that was really the main reason for not taking part in that; because, it was a justification for the building of new nuclear plant'.*

In summary then, NGO reflections on the second theme, consultations timings, appeared as critiques of the order in which decision-making processes are undertaken, where, in the opinions of the interviewees outlined above, consultations were frequently undertaken after the fact.

Finally, on the third theme, the transparency and truthfulness of consultations, Pete Wilkinson explained that for the most recent MRWS consultation on the potential of a waste repository in Copeland and Allerdale, the word safety was only mentioned around once. 'What they talked about is the surface footprint of it, what it would look like, how many jobs it would create – they talked about everything but if the damn thing was safe! They did not mention once that the NDA are sitting on 150 odd potentially show stopping outstanding technical and scientific problems associated with disposal. They just try to side step the issues'. Echoing Pete Wilkinson's sentiment, Ruth Balogh, identified that one of her major procedural concerns was a lack of awareness about the facilities it houses;

> *'One of the things I have found out people did not really know was that it was only a nuclear waste site, people think it is a nuclear power plant – it is wrong, there is not a nuclear power plant there at all, there is a reprocessing facility which does not work properly, and there is a lot of highly dangerous nuclear waste'.*

Ruth said, in this regard, that 'it is not a question of transparency; it is more a question of confusing people and telling them lies'. Ruth also commented that the MRWS process was very longwinded and deliberative, as attempts to get people involved and do things in a public and transparent way meant blind alleys, superfluous material and 'an awful lot of dross'. For Ruth, then, there was a balance between the need for widespread consultation and an efficient and streamlined consultative process. Finally, Ruth added that whilst there were aspects of the process that appeared trustworthy, including the fact that an independent facilitator organised the meetings, they did not have an independent chair, and 'sometimes the chair quite clearly held sway'. Jill Sutcliffe, who also participated in the CoRWM process, agreed that the non-transparency of information made the consultation process more difficult to access. Further, she referenced consultation fatigue and stated that despite some successes in the CoRWM process, 'it was very hard to keep

up when you are on the outer circle; you are running against a very heavy headwind'. This included concern for failings in the translation of technological issues. Jean McSorley added that the nuclear industry is perceived to be arrogant and secretive, because almost all of its activities can be shielded from public and Parliamentary scrutiny under the Official Secrets Act.

Throughout the interviews then, all NGO respondents reflected negatively on incidents of procedural engagement and negatively on their legitimacy. Yet, despite these critiques, four respondents also drew on positive experiences, offering insight into perceived 'just' processes. Martin Forwood felt that at times CORE's voice had been heard, and that as an consequence there was grudging acceptance that the group was useful for keeping the industry on their toes, where they were respected for presenting accurate and reliable opposition. Further, Pete Wilkinson reflected on the Joint Fact-Finding exercise implemented by British Nuclear Fuels Ltd during the BNFL National Stakeholder Dialogue. The Joint Fact-Finding exercise explored, in part, the necessity, potential health impacts, and cost of end of pipe technology to reduce the discharges from Sellafield into the Irish Sea. Through the process, a team of relevant experts were appointed to discuss nuclear management, including individuals with both a pro and anti-nuclear stance. Pete Wilkinson, an anti-nuclear NGO participant in the process, concluded that, 'although you disagree on your positions, you can actually bring a polarised debate much closer together'.

Pete Wilkinson also reflected on his engagement with the CoRWM public engagement exercises, where he believed that through a comprehensive public and stakeholder engagement program 'we not only engaged stakeholders, we also engaged the public through CoRWM'. He added, 'the eye-opening thing for me was when you took ordinary members of the public on this sort of rapid information programme about radioactive waste – we saw them week after week after week, we had four or five weekends in a row with the same people, so their learning curve was

very steep – they realised that there is nothing you can really do constructively with radioactive waste apart from dump it in a hole somewhere or store it indefinitely'.

Continuing the theme of positive recollections of procedural engagement, Andy Blowers gave the example of his 1990s work with RWMAC and later CoRWM, who he thought had a big influence on opening up the debate on nuclear energy, though he did acknowledge 'that was the window of opportunity when the nuclear industry was in retreat'. Later in his career following the MRWS process Andy had tried to convince some of his anti-nuclear colleagues that the MRWS process was effective. Andy added that 'you will always proclaim that people were not consulted, but they made a huge effort I think through deliberation, forms of engagement, all kinds of things'. Finally, Ruth Balogh drew attention to the work of CoRWM, which she stated was rooted in notions of justice and gave an ethical position on inter-generational concerns. She added, 'you do not normally find that in policy documents on nuclear waste. Whether you agree with it or not is another matter but yes, at least it was being open about what its ethical position was on certain aspects of nuclear policy'. Thus, NGO respondents began to construct visions of just procedural engagement.

During the interviews, policy representatives were also asked to evaluate procedural mechanisms. In the resultant discourses policy respondents highlighted both positive examples of procedural engagement successes, as well as considering the difficultly of procedural engagement overall. Thus, policy respondents offered more mixed responses to articulations of procedural justice, reflecting on the themes of (1) successful exercises, (2) consultation timings, and (3) scale.

On the first theme, successful exercises, Gregg Butler provided a positive account of procedural justice as he reflected on the BNFL National Stakeholder Dialogue Joint Fact-Finding Exercise, outlined above by Pete Wilkinson. Gregg stated that one outcome of the project was a process that led to the BNFL installing the end of pipe technology at a lower than anticipated cost. He labelled the exercise a 'seminal

experience', adding that, 'people who have not had that sort of … revelatory experience just talk past each other and say "tis", "tis not", "it is red", "no it is not, it is blue" and nobody gets anywhere'. In this regard, this mechanism was perceived as a useful tool for meaningful collaboration from both pro and anti-nuclear ends of the spectrum. Gregg explained that this process was also seen to have influenced later stakeholder engagement exercises as, for example, the favourably looked-upon Managing Radioactive Waste Safely exercise in West Cumbria which utilised some of the same facilitators and convenors that worked on the BNFL dialogue. In this regard, there was some evidence that positive procedural justice elements had been continued and that experiential learning had been passed on.

Bill Hamilton of the Nuclear Decommissioning Authority explained and defended the role of Site Stakeholder groups, which are funded by the NDA and attended by representatives including local councillors, Sellafield's trade union, and the Parish and County Councils. The groups meet on a regular basis to explore any on-going issues around the Sellafield site. Bill explained that the group is run by an independent secretariat to ensure impartiality, attended by senior representation from Sellafield Ltd, and that they are entirely open to the public, including many members that have been working with nuclear in West Cumbria for many years. For Bill, this ensured multi-generation representation. Gregg Butler also referenced the Sellafield Site Stakeholder Committee, but instead of focusing on the positives of long-stayed representatives, expressed concern that the committee does not get regularly refreshed, can stagnate, and as a result, can cease to represent the local population.

Reflections on the role of the Site Stakeholder Committees also prompted consideration over the differing forms of engagement according to the lifecycle stage of each station. Gregg Butler reflected that once the facility has started its operation, having a Site Stakeholder Committee was sufficient. Giving an example with some comedic value, he went on to state that 'in a steady state there is not much point in

stirring up lots of interest when there is nothing to stir up interest about: “How many terawatt hours did you produce this year?” “ten”. “Oh, that is interesting, how many did you produce last year?” “ten”. “How many are you going to produce next year?” “Oh, ten”’. This point illustrates Gregg’s perspective that whilst on-going procedural mechanisms are required there are specific junctures or points of change within a facility’s lifespan at which they become more important.

For Bill Hamilton, future procedural justice articulations primarily concerned the potential development of a GDF. Bill gave his opinion that that at the end of the most recent MRWS consultation process, the Cumbria County Council chose to override Copeland and Allerdale’s votes of support. As such, DECC and Radioactive Waste Management, a subsidiary of the NDA, was now leading the search across the rest of England and Wales for a potential host site. At the stage of these interviews, prior to January the 1st 2016, community leaders were currently volunteering areas through the Managing Radioactive Waste Safely process, on the understanding that at the end, the area might volunteer to host the facility.

Finally, recollections of positive engagement not only referred to set consultation exercises but also the evolving role of organisations. Bill Hamilton characterised the NDA as an impartial group that could rectify the past procedural mistakes of the BNFL management, which he stated, operated with ‘company sensibility’, focusing on profit and loss. In contrast, Bill explained that the NDA focussed on strategically working with partners, including the local communities, parishes etc. to aid a major transformational process, including granting funding for local projects. This new focus was seen to provide opportunity for remedial engagement.

Despite positive characterisations, however, policy respondents also recognised that stakeholder engagement was recognised as a very challenging process for a number of reasons. Firstly, there was the reoccurring nature of some of the discussions. Steve Thomas recalled that he was hearing the same discourses that were occurring 40

years ago, including promises that 'the transmutation of high-level waste is just around the corner and that will solve the high level waste problem'. Gregg Butler reinforced this concern as he stated that 'there is very little in nuclear that is ever going to surprise anybody because somebody is going to have tried all the arguments. So, I must admit, it gets all gets a bit sterile when you have done it for the 14th time'. Further, Gregg recognised that funding tended to disappear in between major upheavals. He added that 'the whole thing about it is the stakeholder engagement is bloody difficult. It takes a lot of work, so where is the money coming from for a start? And where is the money coming from in the years between major upheavals? If you had carried on properly in between the major upheavals, if there is a major upheaval you have got something to fall back on. You have got people that trust people, you have got people that know people, who know who to talk to'. Gregg added in his capacity as an ex-industry respondent that during some consultation exercises he has been involved in in an advisory role, 'you certainly got a feeling that, as far as the top brass in both organisations are concerned, we are doing stakeholder engagement because it says we have to. Here is a box, we have got to tick it'.

Further, Lynda Warren reflected on CoRWM's involvement with the implementation of the GDF. Lynda explained that due to opposition caused by failed planning enquiries in the past, and because of the success of the approach when taken overseas, the siting process was now based on volunteerism. She cautioned, however, that evidence demonstrates that the overseas approach does not apply here, adding that Europeans, including Sweden and Finland, have more faith in their regulator, whereas the UK as a nation 'tends towards distrust'. In addition, she explained that local communities do not have the same power as the French or the Finnish communities. Thus, the socio-political landscape of Britain was, for Lynda, inhibiting decision-making on the GDF. Further, Lynda offered the opinion that so far the government has always started with the wrong approach to the GDF process: if

you believe it is safe, 'you have got to market it as an opportunity, not as something to compensate'.

The third theme for the policy discourses was scale: more specifically, the scale at which energy decision-making should occur. Lynda Warren explained, for example, that the stakeholder engagement process undertaken depends on the scale in question. Lynda developed the example that for the countrywide National Policy Statement, anyone and everyone could be involved. She reflected that at this level the discussions are easier because they are considering generalities, not sites, and gave the example of the CoRWM public engagement process, a three-year, and several million pound countrywide consultation on radioactive waste management. Although there was no agreement on the outcomes of the final report, she said there was respect about the process that went in to the outcomes, and therefore, the process was deemed successful. In contrast, Development Consent Orders require consultation in more localised areas, where they are asking for concerns around those who are affected, and therefore have interest in the process. Lynda explained that the same is true of Cumbrian decision-making during the GDF siting process as the local council, Copeland, said yes, the county council said no and the government said yes. In terms of the structures of group representation, one idea within CoRWM was to act as an elected body with membership from each representative scale, but they could not agree or get approval on this. Lynda closed by questioning that if the GDF were to be sited in Manchester, do you also speak to people along the transport route? If this were to happen Lynda thinks the government could exercise compulsory purchase along the transport routes.

Gregg Butler referenced Article 46 of the Euratom treaty, for example, which requires international consultation on nuclear developments, including his example of Irish objections to Sellafield. He stated in relation to the necessity of this engagement that:

'We do to the extent we need to and of course, if the arguments next door to the site are fairly polarised with the rest of the UK, they are going to be totally polarised by the time you get to say France, or Germany. They might be polarised in totally different directions in the two, so if you went into an enormous international consolation … how on earth would you reconcile those? And what difference would it make to what you were going to do anyway?'

Finally, Joel Kenrick also expressed the difficulty of consultation scale. Firstly he explained that he assumed those in need of participatory engagement were the local community, which he characterised as being both those who lived nearby and those who were affected by the facility. However, he also discussed the difficulty of working within national boundaries as he asked, 'what should the role of the Irish be in decided what can or cannot happen at Sellafield? Or what should the role of anybody who is actually anyone that is in a pretty large area of the UK who could be impacted if something went seriously wrong?'.

In summary, evaluations of procedural mechanisms around the Sellafield site appeared as both accounts of successes and failures, and as appreciation of the difficulty of ensuring participation.

6.1.3.2 Normative Improvements

In addition to describing current and past procedural mechanisms both NGO and policy respondents also described potential improvements to the procedural systems, albeit more briefly. In so doing the respondents provided normative insight into how procedural justice might materialise and drew attention to the core values that underpinned these mechanisms, building on the positive accounts of procedural engagement outlined above. Further research could engage with this theme in more depth. The results are presented firstly from NGO respondents and secondly from policy respondents.

Jill Sutcliffe, a member of the Nuclear Waste Advisory Associates and an NGO respondent, stated that knowledge transfer and knowledge independence are core aspects of her construction of energy equity. Developing the idea of knowledge transfer in more depth, she gave the example of good practice in Port Hope, Canada, which is sited next to uranium mining tailings. There she identified that the community employed their own scientists to keep the community up to date with the risks of the site, with the intention of encouraging open, transparent and accessible engagement. She recalled that as a consequence of this model, trust has been built with the community. Jill believed that the DECC geological disposal process could adopt a similar framework where the community controls the funds and employs their own independent scientists. For Jill this meant that engagement would not just be top-down, and therefore it provided the opportunity to shift the power balance.

Pete Wilkinson added that his idea of successful procedural engagement is based on the idea of openness and transparency, which although it is a bit of a mantra and can be interpreted differently by different people, 'it should be defined as what it actually means and people should adhere to it and be open and transparent. Make sure you have as many stakeholders' constituencies as you can get, start with as blank a piece of paper as possible and do not railroad people. Let them come to their own decisions about it in an open and frank way and live with the result'.

Both Lynda Warren and Gregg Butler gave policy perspectives on how we *ought* to engage. Lynda began by stating that in hindsight, she would restart the GDF process entirely with no NIREX and no NDA connection. Instead, she would focus on public engagement-based expertise. Lynda also made a case for the importance of oral histories in energy operation and decision-making, reinforcing the importance of knowledge transfer outlined by Jill above. She explained that the legacy of bad waste management at Sellafield reflects, in her opinion, how we all used to deal with waste. She recollected that as a child she would drop litter on the ground, thinking it

was someone else's job to clear it up. In the nuclear context, this means that during the design process no one has thought about how to deal with waste, and in the planning process no one has taken account of human nature. As a further example, Lynda explained that during the decommissioning process at Dounreay, an old worker had to be called in to demonstrate how the equipment actually worked *not* how it was recorded to have worked.

Gregg Butler reflected at length on potential improvements to procedural engagement mechanisms. Gregg began by suggested an Inspectorate of Stakeholder Management, an independent body to assess the efficacy of stakeholder engagement. This body was seen as an opportunity to provide impartial and knowledgeable insight and overcome the problem that, 'I do not think the general consciousness in government of what real stakeholder engagement feels like and looks like is very high, it is not surprising that they set things up with the best of intentions but they do tend to get a lot of lip service, or a lot of "here are the boxes, what do I have to tick the box? I will tick the box"'. Gregg went on to explain that the key thing is stakeholder dialogue, and being up front about what is up for debate; 'it is absolutely dreadful to go in to stakeholder dialogue knowing what the answer is going to be'; 'the worst thing you can possibly do – it is worse than having no stakeholder dialogue at all – is to go to stakeholders with a fait accompli without telling them, or even with telling them'.

Gregg Butler also reflected positively on the process of Stakeholder Preference Mapping whereby you can look at responses to consultations as a tool that can be used during later exercises. Gregg explained that throughout this process, which was used during the BNFL stakeholder dialogue, you can group likeminded stakeholders and identify what kind of groups they are, including those interested in transport, socio-economic development, those wanting specific outcomes etc., 'so, depending on whom you are asking and when, you could tell the government what they are going to get'.

6.1.3.3 Summary of Procedural Articulations

Alongside a high level of evaluative detail, the results of this section have provided key insights into the manifestation of procedural justice in practice. They have demonstrated that articulations of procedural justice vary through time and according to the actor in question. NGO respondents critiqued their experiences of procedural engagement, including concerns over the exclusion of individuals and groups from the proceedings, when consultations took place, and the transparency and truthfulness of consultations. Policy respondents gave more mixed evaluations, reporting on both successful procedural mechanisms and areas of future development; within these discussions policy respondents appeared critical and open to alternatives.

Secondly, extending the theme of time further, the results also demonstrate that procedural justice manifests as both evaluative statements concerning what *is* done, and normative statements reflecting on what *ought* to be done. Here, normative constructions of procedural justice reflected on the themes of openness, transparency, knowledge transfer, knowledge independence and the order of decision-making. In reflecting on how we ought to engage, the respondents gave insight into the perceived core values of just energy decision-making. Thus, overall, the findings have illustrated that the procedural justice concept, and the concept of energy justice more generally, can play a role in current and future energy decision-making. Summaries of the core themes emerging from the procedural justice articulations across time are presented in table 6.4.

Sample Group	NGO	Policy
Evaluative	• Exclusion of individuals and groups from the proceedings • Consultation timings • Transparency and truthfulness of consultations.	• Successful exercises • Consultation timings • Scale
Normative	• Knowledge transfer and knowledge independence • Openness and transparency	• Public engagement-based expertise • Knowledge transfer • Impartial oversight • Consultation timings

Table 6.4 Summary of Procedural Results by Sample Group

6.2 Conclusion

This chapter has presented results from the second of two case studies – the Sellafield Nuclear Complex in Cumbria – thereby addressing the main research question of this thesis, 'how do elite actors within the nuclear energy system articulate energy justice?' from a waste storage, reprocessing and disposal perspective. It has done so by exploring energy justice articulations across three tenets: distributional justice, justice as recognition and procedural justice. Throughout, all evidence was presented with attention to the analytical themes of time and actor, allowing later comparisons across the third variable of investigation, systems component through a comparison with the first case study, energy production. The evidence has demonstrated the utility of this methodological approach in identifying the primary energy justice discourses surrounding the Sellafield Nuclear Complex.

Within the tenet of distributional justice the results above provide three main insights into a complex set of discourses around the Sellafield Nuclear Complex in

Cumbria. They demonstrated, firstly, that distributional justice articulations vary through time as discourses emerged around legacy waste, contemporary management, and future handling, including the potential to move the waste from Sellafield into a Geological Disposal Facility. In this regard, the issue of nuclear waste management appeared to take a distinctive inter-generational pattern, looking both forward and back, illustrating clear changes in historical management practices on the perceived threat of radioactive contamination, the influence of current site handling and new discourses around the possibility of a Geological Disposal Facility, for example. In this regard, distributional justice manifestations vary according to the life cycle stage and processes within a site.

Secondly, the results demonstrate both variation and consistency in the distributional justice articulations according to actor in question, thus moving past typical pro-nuclear and anti-nuclear divides. In many instances, NGO respondents focussed on occurrences of 'injustices', points at which the site was perceived as negatively affecting the local area, whereas policy groups focused positively on the provision of 'justice' in terms of local benefits. Within this framework, NGOs were typically understood to be the recipients of just or unjust practices, and policy groups as the providers. However, the results also demonstrated united concerns over management practices and radioactive contamination. Thus, in the case of policy respondents, they demonstrate attention to 'non-nuclear', the promotion of jobs and economic development, for example, and more negatively perceived nuclear elements in terms of cost and radioactivity.

Finally, the results demonstrated that in many cases, waste storage, reprocessing and disposal at Sellafield was perceived to be intimately linked with other stages of the nuclear system, including energy production, uranium mining, and military uranium production, strengthening the case for whole-systems approaches to energy governance.

For the second tenet, justice as recognition, the results of the interviews gave insight into the questions of not only 'justice for whom?' but also 'justice *by* whom?'. Firstly, the results demonstrate that calls for justice as recognition varied according to the sample group in question. In this regard, operations at Sellafield were not perceived to be to the benefit or burden of any one particular social group, but rather a range of groups. By considering the question of 'justice *by* whom?', the interview respondents highlighted who is perceived to be responsible for remediating injustices, or conversely, ensuring the continuation of just practices. In discussing this idea of responsibility the respondents advanced the typical application of justice as recognition, which, generally speaking, has focused on the recipient of benefits or ills only, not those who create them. In terms of attributing responsibility, the results demonstrate that whilst everyone was perceived to share responsibility for injustice, both groups identified that government and industry were ultimately responsible for nuclear waste storage, disposal and reprocessing operations. Within this framework, they are the providers of energy justice, and the NGOs the assessors.

Last, the results provided three key insights into the manifestation of procedural justice in practice. Firstly, they have demonstrated that articulations of procedural justice vary according to the actor in question. Secondly, extending the theme of time further, the results also demonstrate that procedural justice manifests as both evaluative statements concerning what *is* done, and normative statements reflecting on what *ought* to be done. Here, constructions of normative statements around procedural justice reflected on the themes of openness, transparency, knowledge transfer, knowledge independence and the order of decision-making. In reflecting on how we ought to engage, the respondents gave insight into the perceived core values of just energy decision-making. This demonstrates that the procedural justice concept, and the concept of energy justice more generally, can play a role in current and future energy decision-making.

Table 6.5 presents simplified findings from this case study as a means of contrasting them to the other case study, energy production at Hinkley Point Nuclear Complex in the UK.

Tenet	Sample Group	Themes
Distributional Justice	NGOs	Radioactive contamination, health, military usages, jobs and economic prosperity, cost of nuclear waste management, and safety and emergency planning, facility maintenance, technological feasibility, connections with new build nuclear stations and growth and development
	Policy	Radioactive contamination, military usages, jobs and economic prosperity, the cost of nuclear waste management, facility maintenance, uncertainty and growth and development
Justice as Recognition	NGOs	**For Whom:** populations affected by radioactive discharges, future generations, uranium miners **By Whom:** industry and policy
	Policy	**For Whom:** Local communities, populations affected by radioactive discharges, future generations, tax payers, volunteer host communities for the GDF **By Whom:** Industry and policy
Procedural Justice	NGOs	**Evaluative:** The exclusion of individuals and groups from the proceedings, consultation timings, the transparency and truthfulness of consultations **Normative:** Knowledge transfer, knowledge independence, openness and transparency
	Policy	**Evaluative:** Successful exercises, consultation timings, scale **Normative:** Public-engagement based expertise, knowledge transfer, impartial oversight, consultation timings

Table 6.5 Sellafield Nuclear Complex Results Summary

Chapter 7: Discussion

Within the broader context of the socio-technical systems and multi-level perspective literatures, this thesis has sought to advance the understanding that concepts from ethics and justice provide a structure to think about energy dilemmas (Sovacool *et al.* 2016). Against this background, it has aimed to introduce, critique, and reconceptualise the theory of energy justice as it stands to date, assessing if, and in what form, its core tenets of distributional justice, justice as recognition and procedural justice emerge in practice (McCauley *et al.* 2013). It has done so through the exploration of three areas of conceptual growth in the energy justice literature highlighted in the literature review, represented by the three key variables of time, systems component and actor. Throughout, it has utilised a whole-systems approach, whereby it has investigated elite perspectives on energy justice across two indicative stages of the nuclear energy lifecycle represented by case studies of (1) energy production at the Hinkley Point Nuclear Complex in Somerset, and (2) waste reprocessing, storage, and disposal at the Sellafield Nuclear Complex in Cumbria. This research is amongst the first to advance a whole-systems approach to energy justice discourses (Hall *et al.* 2013; van der Horst and Evans 2010; Adams *et al.* 2012; Hiteva 2013; Harrison 2013), and is the first to take an explicitly elite focus to energy justice as it addresses the overall research question and research questions:

Overall Research Question: How do elite actors within the nuclear energy system articulate energy justice?

RQ 1: How do the energy justice articulations of elite actors vary through time?

RQ 2: How do the energy justice articulations of elite actors vary according to energy systems component in question?

RQ 3: How do the energy justice articulations of elite actors vary between actors?

This chapter consolidates the results from chapters 5 and 6 and draws parallels with the wider literature presented in chapter 2, as well as introducing new literatures in light of its findings. Firstly, section 7.1 compares the results of the two case studies, before section 7.2 discusses emergent knowledge claims, the themes of (1) facility lifecycles, (2) systems approaches, and (3) the question of 'justice by whom?'. In so doing, sections 7.1 and 7.2 outline the contributions of this study to knowledge in relation to the study's research questions, and examine its contributions to academic thought. Last, section 7.3 offers initial interpretations of the implications of these key contributions for nuclear energy scholarship, UK nuclear policy, and the wider energy transitions literature.

7.1 Case Study Comparison

This section returns to the findings presented in the results chapters to draw comparisons between the two case studies of research: (1) energy production at the Hinkley Point Nuclear Complex in Somerset, and (2) waste reprocessing, storage, and disposal at the Sellafield Nuclear Complex in Cumbria. It does so according to the three tenets of distributional justice, justice as recognition, and procedural justice, mirroring the approached used in chapters 5 and 6. Throughout, it draws on examples from these chapters and, in view of its findings, discusses new insights into the manifestation of energy justice in practice. It considers the ideas of non-nuclearity and NIMBYism; the case that justice as recognition reveals that energy justice is perceived to affect elite groups, not just poor ethnic minorities; and the finding that procedural justice investigations offer normative contributions.

7.1.1 Distributional Justice

The results of this research have revealed both similarities and differences in distributional justice articulations across the two research case studies. These results are compared here before introducing the concept of non-nuclearity and rejecting

the idea of NIMBYism as a reflection of the fact that distributional justice discourses between NGO and policy respondents moved past assumed pro- and anti-nuclear divides. To begin, table 7.1 outlines the themes raised by NGO and policy participants across the two research case studies.

Hinkley Point Nuclear Complex	Sellafield Nuclear Complex
• Disruption during infrastructure development • Radioactive contamination • Health and safety • Jobs and economic prosperity • Education • Cost	• Radioactive contamination • Health • Military usages • Jobs and economic prosperity • Safety and emergency planning • Planning for contemporary and legacy wastes • The cost of nuclear waste management

Table 7.1 Hinkley Point and Sellafield Case Comparison: Distributional Justice

The most notable contrast between the two sites was the emergence of non-nuclear distributional justice discourses in the Hinkley Point case study, and more classically nuclear discourses in the Sellafield case study. For Hinkley Point, articulations of distributional justice did not just focus on the nuclear facility itself, instead manifesting as concerns over its associated developments, most frequently including local road infrastructure. NGO respondents referenced the on-going construction works at Hinkley Point C and their impacts of lorry traffic, the influx of workers, local biodiversity displacement, housing development and rent prices, and the clearance of significant areas of archaeological remains, for example. Furthermore, policy respondents focussed on issues of jobs, economic prosperity and education as positive cases of the provision of justice, without reference to wider nuclear critiques. Indeed, Hergen Haye, an unaffiliated policy respondent stated that ‘in

nuclear terms, we have identified all the communities that already have nuclear power – have had it for the last 40 years – and broadly speaking (there are always pockets) but broadly speaking, these communities want nuclear power stations to be built'. In this context, the siting of the proposed Hinkley Point C station was taken to be contingent upon the social acceptance of the pre-existing Hinkley Point A and B facilities. Thus, distributional justice concerns appeared as comparatively benign and detached from assumed nuclear risk discourses. This is taken to represent a degree of 'non-nuclearity', the detachment of energy justice discourses from issues of nuclear energy production. The use of this term extends Hecht's (2012) idea of 'nuclearity', which she uses as a techno-political category to describe the 'quality of being nuclear', to move past considerations of either pro- or anti-nuclearity to recognition of non-nuclearity, the impact of associated non-energy-specific infrastructural developments as part of energy justice discourse.

In contrast, the discourses emergent from the Sellafield case study appeared more classically nuclear in nature as the interview respondents raised the distributional themes of radioactive contamination, health, military uses, safety and emergency planning, and planning for contemporary and legacy wastes as concerns rooted in past accidents and poor management practice. Oliver Epsom, a former nuclear engineer and now engineer for SSE Renewables, described one such historical incident when the workers at Sellafield had been 'chucking waste into swimming pools without even knowing how much you were throwing in there or where it came from'. For Hergen Haye, such lax practices led to the hazards of the highly radioactive waste produced by the weapons program, the damage done to the Windscale Piles during the 1957 fires, and the existence of their associated storage ponds and silos, for which there is no known inventory. He concluded that the complexity of the nuclear waste problem in the UK was, in fact, the complexity of Sellafield. Given that Sellafield was the first nuclear site in the UK and that it has been criticised for a lack of technical understanding and regulation compared to later sites (see Kershaw *et al.* 2001; Dunster 1984; Nilstun and Inskip 1996; Macgill 1989) it is reasonable to

assume that the distributional justice outcomes are a consequence of the timing of its development, and the ensuing mistakes made in its operation.

This research posits that this distinction between how actors articulate each site is an outcome of perceived risk, where individuals frame issues in terms of 'nuclearity' when perceived risk is high and 'non-nuclearity' when the risks appears more benign. This assertion both follows and develops the work of Venables *et al.* (2012), who highlight two potential explanations for apparently low levels of perceived risk around energy facilities. Firstly, Venables *et al.* (2012) introduce a body of authors who believe that in the absence of major accidents – as is the case with Hinkley Point – increased familiarity creates lower levels of perceived risk and more positive attitudes (e.g. Greenberg 2009; Lima 2004; Lima and Marques 2005; Parkhill *et al.* 2010; Fahlquist and Roeser 2014; Downer 2015). Secondly, Venables *et al.* (2012) identify a range of researchers who suggest that more positive attitudes may arise from perceived economic and social benefits of the facility to local people (e.g. Blowers and Leroy 1994; Burningham and Thrush 2004; Hecht 1998; Williams *et al.* 1999). Both explanations fit with the research findings which demonstrate that firstly, NGO energy justice discourses emerge as a concern not for the nuclear facility itself, but instead for its surrounding infrastructure, and secondly that policy discourses framed Hinkley Point positively in terms of the job and economic benefits it provides. As an extension, these examples serve to highlight that distributional justice discourses are an outcome of the processes and history at a particular facility, and that, dependent on the levels of perceived risk that the facility presents, energy justice discourses may transcend energy-specific concerns.

Moreover, in both case studies the results also demonstrated cases of consistency in the distributional justice articulations according to the actor group in question – NGO or policy – thus moving past typical pro-nuclear and anti-nuclear divides. In many instances, NGO respondents focussed on occurrences of 'injustices', points at which the site was perceived as negatively affecting the local area, whereas policy groups

focused positively on the provision of 'justice' in terms of local benefits. However, the results also demonstrated moments of distributional justice overlap. This included united concerns from all represented actors over the costs of nuclear power in terms of the costs of new build in the Hinkley case, and united concerns over the cost of waste management, management practices and radioactive contamination in the Sellafield case. Finally, the policy respondent discourses around the Sellafield facility drew attention to both 'non-nuclear' distributional justice manifestations – the promotion of jobs and economic development, for example – alongside more negatively perceived nuclear elements in terms of cost and radioactivity; in this regard, policy respondents appeared both pro- and anti-nuclear.

Given the emergence of both differences and similarities in distributional justice articulations according to the actor in question, the results demonstrate the need to move past typically assumed pro- and anti-nuclear divides and to reject the assumed idea of NIMBYism. Devine-Wright (2009: 430) defines this as public opposition to unwanted local developments, or more formally, 'the protectionist attitudes of and oppositional tactics adopted by community groups facing an unwelcome development in their neighbourhood'. Thus, in summary, this represents a call to consider the discourses of a diverse range of social groups who simultaneously recognise both the justice burdens and benefits of energy infrastructures, sometimes extending beyond the energy facility itself.

7.1.2 Justice as Recognition

In keeping with the distributional justice results of this study presented in section 7.1.1, the results have revealed both similarities and differences in justice as recognition articulations across the two research case studies. These results are compared here. Firstly, reflecting on responses to the question 'justice for whom?', this section describes that the operations were perceived to both positively and negatively affect a range of stakeholder groups. It follows that energy justice

concerns are both expressed by and perceived to affect elite groups, not just poor ethnic minorities. Secondly, it briefly considers the question of 'justice by whom?' as it discusses how, in the context of the UK nuclear energy case studies presented in this work, industry and policy groups were perceived to hold a higher degree of responsibility for the provision of energy justice than other actors in the nuclear energy system. This concept is explored further in section 7.2.3 as one of three emergent key contributions from this research. Table 7.2 outlines the themes raised by NGO and policy participants across the two research case studies.

Hinkley Point Nuclear Complex	Sellafield Nuclear Complex
For Whom: • Workers • Those affected by health impacts • International actors • Future generations • Consumers • Youth • Local communities **By Whom:** • Industry • Policy (Inc. local councils) • NGO groups • Regulators	**For Whom:** • Populations affected by radioactive discharges • Future generations • Uranium miners • Local communities • Tax Payers • Volunteer host communities for the GDF **By Whom:** • Industry • Policy

Table 7.2 Hinkley Point and Sellafield Case Comparison: Justice as Recognition

Interview respondents reflecting on the question of 'justice for whom?', provided both evaluative and normative accounts of justice as recognition, addressing who 'is' in focus – local communities, and workers, for example – as well as who 'ought' to be

– including international actors at the stage of uranium mining. Across the two case studies, 13 justice as recognition themes emerged from the interview discussions; thus, the operations at the two case studies were not perceived to be to the benefit or burden of any one particular social group. This included shared concern by the participants in the Hinkley Point and Sellafield cases for populations affected by radioactive discharges, including workers, local communities, future generations and those affected by health impacts (or populations affected by radioactive discharges as it is termed in the Sellafield case), but revealed differences in each case study over the need to recognise other actor groups including uranium miners, youth, consumers, tax payers and volunteer host communities for the GDF.

In both case studies, NGOs were primarily concerned with those negatively affected by the facility as opposed to policy groups who focused on those that would gain from it, illustrating differences in the framings of justice as recognition. As an example from the Hinkley Point case, Stop Hinkley members Sue Aubrey and Allan Jeffrey began by recognising that the Hinkley Point complex was a good source of employment in an area where no other industry was particularly stable. However, they also identified that this employment meant higher exposure to the risks of potential health impacts. Primarily, this concerned workers at the facility who faced a greater risk of exposure to radioactive contamination, thus recasting the provision of jobs in a negative light. Jill Sutcliffe, a member of the Nuclear Waste Advisory Associates and respondent for the Sellafield case study, identified this as the 'sweet and sour effect', where workers have a vested interest in the Sellafield complex due to their jobs and working and family relationships, but face negative health outcomes as a consequence of their involvement. In contrast, policy respondents highlighted workers in only a positive sense, without connection to the negative health externalities. This shows that even when a group is recognised, it may be for both positive and negative reasons, so demonstrating the complexity of energy justice manifestations in the nuclear case.

Within such discourses, issues of energy justice were described as affecting both elite and non-elite actors. Hergen Haye, an unattributed respondent who spoke to both case studies, identified energy justice responsibilities to business and industry, for example, as (1) they were reliant on large quantities of base-load energy, and (2) the nuclear industry and associated wider industry groups themselves created and sustained a broad spectrum of jobs and careers that they could capitalise on – in the Hinkley Point case this included a new fleet of nuclear power stations. Further, Representative Four from Energy Company One stressed too that if you are the current operator of a facility and therefore the producer of waste, you have a moral and legal responsibility to ensure that it is safely stored and safely disposed of. Thus, they recognised the importance of their own role and the energy justice burdens it presented.

The inclusion of elite groups in justice as recognition discourses questions the activist origins of energy justice. With its roots in the environmental justice movement, applications of justice as recognition are typically manifested as concerns that 'minorities, low income, and otherwise disadvantaged and susceptible neighbourhoods are disproportionately exposed to environmental hazards' (Bowen 2002: 3), highlighting local community, activist perspectives. Together with links to the politically excluded civil rights movements across North America (Gibson-Wood and Wakefield 2013), this includes attention to issues of class (Taylor 2000), gender (Buckingham and Kulcur 2009) and religion (Schlosberg and Carruthers 2010). Thus, the focus was and is on the groups that were facing perceived injustices in the form of the unequal distribution of environmental risk. The results demonstrated however, that elite actors – NGO and policy groups (including the academic experts and industry representatives subsumed within this second category) – are both concerned with and perceive themselves to be affected by energy justice concerns, even when claims vary across the sample groups. This finding illustrates that energy justice investigations must widen their scope beyond solely bottom-up activist concerns. Building on the work of Fraser (1999), this requires the recognition not

only of the divergent perspectives of different ethnic, racial and gender differences, but, as this study has suggested, the perspectives of different operative groups. This finding evidences the claim of 'an anti-establishment' past to energy justice discourses referenced in Jenkins *et al.* (2016a: 180).

Secondly, the results of both case studies showed not only who justice is for, but also who is responsible for it, thereby attributing responsibility. The results also show that whilst NGO and policy groups are understood to share responsibility for the production of energy justice, industry and policy respondents are assumed to carry a higher *degree* of responsibility. This concept is discussed further in section 7.2.3, which considers the key contribution of this research, the question of 'justice by whom?'.

7.1.3 Procedural Justice

Procedural justice articulations manifested as the emergence of both evaluative and normative reflections on energy justice as respondents considered (1) how procedural justice *is being or has been* enacted (evaluative) and (2) how it *ought* to be enacted (normative). In contrast to the results for the previous two tenets, the findings for the procedural justice investigations primarily demonstrate consistencies in the articulations across the two case studies. These results are presented here. It is argued that with further research – outside the scope of this research – it may be possible to develop a set of overarching energy justice frames representing a united concern, for example for transparency and due process. In keeping with the format above, table 7.3 first outlines the themes raised by NGO and policy participants across the two research case studies.

Hinkley Point Nuclear Complex	Sellafield Nuclear Complex
Evaluative: • Scope of the discussion • Consultation accessibility • The timing of procedural engagement • The exclusion of individuals and groups from the proceedings • Successful consultations • Low participation levels • Accessibility concerns • Consultation stage • Over-consultation	**Evaluative:** • The exclusion of individuals and groups from the proceedings • Consultation timings • The transparency and truthfulness of consultations • Successful exercises • Scale
Normative: • Financial support • Transparency • Nuclear Guardianship/education • Local community-led • Independent • Community benefit • Regulatory oversight • Consultation timings	**Normative:** • Knowledge transfer • Knowledge independence • Openness and transparency • Public-engagement based expertise • Impartial oversight • Consultation timings

Table 7.3 Hinkley Point and Sellafield Case Comparison: Procedural Justice

In the Hinkley Point case study, the majority of procedural justice discussions revolved around the development of the new Hinkley Point C facility. For NGOs these discussions primarily took the form of critiques of their experiences of procedural engagement, including concerns over the scope of the discussions, the accessibility of mechanism both in terms of the technicality of the process and physical attendance, and the exclusion of individuals and groups from the proceedings. Policy respondents gave more mixed evaluations, reporting on both successful procedural mechanisms and areas of future development. Procedural justice articulations for the Sellafield case followed a similar pattern as NGO respondents firstly critiqued their experiences of procedural engagement, including concerns over the exclusion of individuals and groups from the proceedings, when consultations took place, and

the transparency and truthfulness of consultations. As one of numerous examples, Pete Wilkinson stated that whilst the regulators' (the NDA and ONR) job is to look after safety and security, he got the impression that the assessment processes that they go through are very routine, and that their overriding desire is to make sure that they enable the policy to go through. Within this commentary, he questioned the legitimacy of claims that the radioactive waste management plans for new nuclear are in place, adding that 'none of the backend issues to do with radioactive waste have been resolved, yet ministers still say that the situation is sufficiently stable for them to go ahead with a minimum of 10 GW of new build. I mean the whole thing is absolutely crazy, absolutely ridiculous'. Likewise, policy respondents in the Sellafield case reported on both successful exercises and areas of development.

These areas of future development manifested as insights into normative constructions of 'just' processes, where in reflecting on how we ought to engage the respondents offered insights into the perceived core values of just energy decision-making. It is in this area that the primary similarities across case studies emerged. As an example, Ruth Balogh, a nuclear campaigner for West Cumbria and North Lakes Friends of the Earth, drew attention to the work of CoRWM, which she stated was rooted in notions of justice and gave an ethical position on inter-generational concerns. She added, 'you do not normally find that in policy documents on nuclear waste. Whether you agree with it or not is another matter but yes, at least it was being open about what its ethical position was on certain aspects of nuclear policy'. Thus, she referenced what she perceived to be core constituents of energy justice. Further, Gregg Butler provided a positive account of procedural justice as he reflected on the BNFL National Stakeholder Dialogue Joint Fact-Finding Exercise, which he characterised as a 'seminal experience' and a useful tool for meaningful collaboration from both pro- and anti-nuclear ends of the spectrum, and which influenced later stakeholder engagement exercises, including the Managing Radioactive Waste Safely exercise in West Cumbria. In this context, there were consistencies in the discourses presented at each research site, therefore pointing to

the existence of overarching energy justice frames. Indeed, in describing potential improvements to procedural systems and providing insights into how procedural justice might materialise, respondents drew attention to the core values that underpinned these mechanisms, including openness, transparency, knowledge transfer, knowledge independence, the order of decision-making and due process. Thus, overall, the findings have illustrated that the procedural justice concept, and the concept of energy justice more generally, can play a role in both current and future energy decision-making, informed by a set of core principles.

Following Jenkins *et al.* (2016a), this chapter argues that the evaluative and normative reach of energy justice gives a dual analytical role for the concept (table 7.4). Firstly, as stated from the outset of this research, the investigation of past and present injustices provides the opportunity to remediate these failures. Secondly, it demonstrates that energy justice emerges as a tool that can identify potential injustices in the future, making recommendations on how they should be approached. The emergence of these core notions develops the work of Sovacool and Dworkin (2015) who identify availability, affordability, due process, good governance, prudence, inter-generational equity, intra-generational equity and responsibility as central energy justice principles that, when overcoming the neglect of social justice in energy decision-making, should help inform our energy choices.

Tenet	Evaluative	Normative
What: Distributional	What are the injustices?	How should we solve them?
Who: Justice as Recognition	Who is ignored?	How should we recognise?
How: Procedural	Is there fair process?	Which new processes?

Table 7.4 The Evaluative and Normative Contributions of Energy Justice (Adapted from Jenkins *et al.* 2016a)

7.1.4 Summary of Case Study Comparison Findings

This section reflected upon the findings presented in the results chapters to draw comparisons between the two case studies according to the three tenets of energy justice, namely distributional justice, justice as recognition, and procedural justice. In drawing on examples from the results chapters, and in light of its findings, it introduced new insights into the manifestation of energy justice in practice as it discussed the concepts of non-nuclearity and NIMBYism, the case that justice as recognition reveals that energy justice is perceived to affect elite groups, not just poor ethnic minorities, and that within the tenet of procedural justice, investigations offer normative contributions of how energy justice *ought* to emerge. Drawing on these insights and the material presented in chapters 5 and 6, this chapter now presents three key knowledge claims emergent from this research.

7.2 Key Knowledge Claims

As it is outwith the scope of this chapter to reflect on all of the discoveries presented in the results chapters, it discusses the most original findings – those that either contrast with the current literature, advance it, or signal new avenues of future research (table 7.5). The following three sections represent the main contributions of this research to academic thought. Specifically, the sections introduce three key knowledge claims according to the three variables of investigation, time, systems component and actor: (1) facility lifecycles, (2) systems approaches, and (3) the question of 'justice by whom?'. Firstly, it illustrates the necessity of considering multi-cyclical notions of time that can (1) capture the transition of time at a particular site as part of its lifecycle, and (2) capture time across the energy system in total. Secondly, it argues for a whole-systems approach to energy justice investigations, including consideration of all systems components throughout an energy form's lifecycle as a means of incorporating all the justice-related aspects of an energy source. Finally, it considers the question of 'justice by whom?' as it

explores who is perceived to be responsible for remediating injustices, or conversely, ensuring the continuation of just practices.

Variable of Investigation	Key Contribution
Time	Facility lifecycles
Systems Component	Systems approaches
Actor	Justice by whom?

Table 7.5 Summary of Key Contribution by Variable of Investigation

Returning to the discussion of the data analysis stages outlined in section 3.5.3 the discussion below and the analytical themes presented represent the third and final phase of data analysis. This stage of the research requires not just a record of conceptions of energy justice, but an understanding of their construction and articulation. Thus, it follows Thomas and Harden's (2008) strategy of 'going beyond'. This requires an advancement of the descriptive themes achieved in the results chapters above to create additional concepts, understanding or hypotheses. In following the three analytical themes of investigation throughout this research – time, systems component and actor – this section presents new insights within each of these previously identified areas of development for the energy justice literature outlined in section 2.6.

7.2.1 Reflecting on Temporality

The discussion of temporality in this thesis began by drawing attention to Heffron *et al*.'s (2015: 169) statement that 'energy justice is an inherently spatial, *temporal* and social concept', and outlining the understated and confusing treatment of time within current research. It explained that where temporal considerations do appear, they do so in strongly contrasting ways as the literature either highlights a tendency to look back in time, taking an evaluative approach focused on the remediation of

past injustices, or in contrast, focuses on mitigation of potential injustices in the future (Sidortsov and Sovacool 2015; Sovacool 2013; Heffron *et al.* 2015). Developing the arguments presented in chapter 2, this section now highlights the increasing body of work which focuses on what is required to ensure energy justice, including reducing energy consumption (Hall 2013; Jenkins *et al.* 2014), mitigating climate change (Bickerstaff *et al.* 2013) and reframing policy (McCauley *et al*. 2013), for example – at the expense of considering temporal dynamics of *when* changes take place and how these processes overlap (McCauley *et al.* forthcoming). Building on this area of growth in the energy justice literature, it draws attention not only to evolving energy justice discourses through time, but as its key contribution, to the theme of facility lifecycles. This includes both circular and linear notions of temporality. Each of these points is considered in turn below following a brief discussion of RQ1, 'how do the energy justice articulations of elite actors vary through time?'.

In both the Hinkley Point and Sellafield case studies the issue of time emerged as a cross-cutting theme. In the Hinkley Point case study this included concern for the time taken to construct the new Hinkley Point facility, historic leaks that led to the community being prescribed iodine tablets, the longevity of the Hinkley Point complex in the landscape, questions over the uncertainty of processes and organisations that will exist in the future, the necessity of recognising future generations, and the timing of and time required to complete consultations. Considerations of time were even more apparent in the Sellafield case study as respondents reflected on past, present and future articulations of distributional justice, deliberating past management practice and historical incidents, current issues, and the long-term question of how to deal with nuclear waste. Using NGO articulations of distributional justice as an example, this temporal change between past and future discourses changed the topic of concern from radioactive contamination, health and military usages to future concerns over facility maintenance, the technological feasibility of geological disposal facilities and the

interconnectedness of waste discourses with new build nuclear power stations. Thus, in answer to RQ1, the answer appeared to be 'extensively'. This suggests that the issue of temporality in energy justice research is a productive and necessary area of research, a point considered further below through a consideration of the emergent theme of facility lifecycles.

The results presented in chapters 5 and 6 demonstrated that energy justice discourses varied at one site due to its evolving operational status through time, its *own* life cycle. Doug Bamsey, Corporate Director of Sedgemoor District Council, explained in the Hinkley Point Case study, for example, that the Hinkley Point A station was being decommissioned, the lifespan of Hinkley Point B is being extended, and Hinkley Point C is being constructed. Doug continued that as local consultations are not required for extension or decommissioning processes, these different lifecycle states at the same site required different procedural justice mechanisms. Furthermore, Doug outlined that each station raised different distributional justice concerns, with the issues around Hinkley Point A typically appearing as concerns for waste, contamination and safety in contrast to the issues of area transformation raised by Hinkley Point C. In essence, as the facility or facilities at a site evolve, so too do the distributional and procedural justice issues they raise.

This finding that energy justice articulations varied at one site due to its own lifecycle was also supported by the results of the Sellafield case study, where clear changes in historical management practices – including the cessation of radioactive discharges from Sellafield into the Irish Sea following direct action led by Greenpeace – influenced the perceived threat of radioactive contamination. Indeed, Hergen Haye suggested that in contrast to early critiques of the operations at Sellafield, the industry has now learnt to build nuclear power stations with decommissioning in mind, and has far more clarity about what is in waste storage ponds, flasks or silos, therefore ensuring that future waste handling will be much more predictable. Thus,

as a consequence of both the transition of time and evolving skill across it, perceived risk changed, and as a consequence discourses of energy justices varied.

Returning to an earlier case study from the energy justice literature, Heffron *et al.'s* (2015: 169) study on the utility of the energy justice concept for solving the energy trilemma argues that energy justice is specifically intertwined with the development of new energy infrastructure, and 'that this is where the value and effectiveness of energy justice can be delivered in policy application'. Yet, as demonstrated above, this fails to evaluate and inform energy justice throughout the various stages of that site's lifespan. Indeed, excepting the work of Rehner and McCauley (2016) who consider the justice implications of the nuclear phase-out in Germany, there is a failure to recognise the implications of closing infrastructure, changing policies, or accidents that may alter the energy justice discourses around a particular site. Instead, energy justice scholarship often appears as a static case study (see Reames 2016; Simpson and Clifton 2016; Yenneti and Day 2016). Consequently, it is reasonable to suppose that such approaches also fail to address the potential to remediate past injustices at pre-existing sites. Going forward, energy justice scholarship must include attention to the evolution of sites and practices through time.

Secondly, the results have illustrated that rather than being a discrete linear system, each stage within the nuclear lifecycle – in this research energy production and waste reprocessing, storage, and disposal – operates simultaneously and overlaps. Despite the inherent logic of this claim, the wider literature contains a predominance of linear notions of time, where each stage is treated separately, what Nasir *et al.* (2016: 2) identify as the 'take-make-dispose resource model' (see Simpson and Clifton 2016; Yenneti and Day 2016; Goedkoop and Devine-Wright 2016 for energy production examples). Yet to treat these stages as discrete represents a failure to acknowledge the passing of time across the entire energy lifecycle – uranium mining, milling, enrichment, energy production and so forth – as each system stage happens

simultaneously, and injustices in energy production can translate to injustices in both mining and waste disposal as each operation implicates the other (McLaren *et al.* 2013). Whilst this in itself is not revelatory, it demonstrates the necessity of understanding energy systems as multi-cyclical and self-reinforcing. The claim for a multi-cyclical approach to energy justice concerns moves past the traditional understanding of a circular lifecycle – 'enabling products at the end of their life cycle to re-enter the supply chain as a production input through recycling, re-usage or remanufacturing' (Nasir *et al.* 2016: 2) – to acknowledge the simultaneous operation of each stage and therefore, the frequent potential and reinforcing moments of injustice.

7.2.2 Reflecting on Systems

Section 2.7 presented a conceptual claim for a whole-systems approach to energy justice as recognition of both perceived and realised failures in energy systems governance, the understanding, for example, that some of our typically national-scale 'solutions' to energy concerns both cause and fail to recognise widespread externalities, including the issues of climate change and resource depletion (Gagnon *et al.* 2002; Meadows 2009; Sovacool *et al.* 2014). It reflected on the need for a multi-scalar focus to energy concerns, and on the acknowledgement, according to Holifield *et al.* (2009: 4), that 'place-specific policies and practices can have consequences that cross national boundaries, affect multiple scales, and extend across global networks'. The following paragraphs develop this literature in light of the research findings.

In answer to RQ2, 'how do the energy justice articulations of elite actors vary according to energy systems component in question?', the results demonstrated both (1) variation between the emergent discourses at each case study and (2) that each systems stage implicated another. Firstly, as discussed in section 7.1 above, the two research case studies raised different energy justice concerns according to the

processes undertaken. Discourses at the Hinkley Point site reflected a degree of non-nuclearity – the impact of associated non-energy-specific infrastructural developments as part of energy justice discourses (e.g. road infrastructure) – whereas discourses around Sellafield reflected more classically nuclear critiques, including the themes of radioactive contamination, health, military usages, and safety and emergency planning. Secondly, the results demonstrated that in many cases, the different stages of the nuclear energy system were perceived as interlinked. By way of an example, in the Hinkley Point case study three NGO respondents raised the need to recognise those in uranium mining areas in terms of their rights to energy justice. Josephine Smolton, a member of the anti-nuclear campaign group Stop Hinkley, argued that UK policy approaches to nuclear energy were too narrow, neglecting the full life cycle implications of the technology. Josephine stated that 'when it comes to something that you are creating that affects the planet, the whole planet needs to be around that table, not a government. It is not one government's decision; it is unethical to make decisions in one country that are going to affect people around the world'. Furthermore, in the Sellafield case, NGO respondents highlighted connections between nuclear waste management and new build nuclear power. As an example, Ruth Balogh explained that according to CoRWM's commentary on the MRWS process, the search for a GDF should be taking place independently of new build nuclear as a means of disposing of legacy wastes only, but that in her opinion, these decisions had gone hand-in-hand. Consequently, the results have both verified and demonstrated the necessity of systems-wide approaches that can capture these dynamics.

Although a growing number of authors have reflected on the need for whole-systems approaches (see Hall *et al.* 2013; van der Horst and Evans 2010; Adams *et al.* 2012; Hiteva 2013; Harrison 2013; Fuller and McCauley 2016; McLaren *et al.* 2013), this literature is not fully developed, with scant empirical reinforcement and little discussion of what such an approach means for energy justice theory (Jenkins *et al.* 2014; Jenkins *et al.* 2016a,b; Bickerstaff *et al.* 2013). Indeed, a search of related

publications demonstrates a continued tendency to consider limited stages of energy lifecycles, with a focus on energy justice as a matter of energy production (see Simpson and Clifton 2016; Yenneti and Day 2016; Goedkoop and Devine-Wright 2016) or energy consumption (Liddell *et al.* 2016; Simcock and Mullen 2016; Walker *et al.* 2016; Chatterton *et al.* 2016; Mullen and Marsden 2016). With a few notable exceptions (Rehner and McCauley 2016; Graetz 2015; Jenkins *et al.* 2016a), this represents an under-emphasis of the full energy lifecycle, including (in the case of nuclear power) uranium mining, uranium milling, conversion, enrichment, fuel fabrication, production, recycling and waste. This highlights the need for a whole-systems approach to energy justice investigations, including consideration of all systems components throughout an energy form's lifecycle.

As argued by Heffron and McCauley (2014), this implies that such a systems-wide focus has two implications: (1) it allows the energy technology to be valued at full cost, and (2) this valuation would affect whether it is chosen as an energy source. Thus, whole-systems approaches provide a means of capturing all the justice-related aspects of an energy source as they (1) capture the energy justice nature of specific systems components – energy production, for example – and, (2) as a sum total of these parts, capture the energy justice nature of a particular energy form. In this respect, a whole-systems approach to energy justice provides a new framework for bridging existing and future research on energy production and consumption. This argument builds upon and furthers the work of Jenkins *et al.* (2014) and Jenkins *et al.* (2016a,b) and situates this research within an emerging body of literature seeking to embed questions of justice and equity within energy systems (Fuller and McCauley 2016; Bickerstaff *et al.* 2013; McLaren *et al.* 2013; Adams *et al.* 2013; Sovacool 2013; Sovacool and Dworkin 2014, 2015).

Conceptually, such an approach fits with Sovacool and Dworkin's (2015: 436) characterisation of energy justice as a 'global energy system that fairly disseminates both the benefits and costs of energy services, and one that has representative and

impartial energy decision-making'. In essence, it seeks to reduce the energy justice externality and consider the justice implications of our energy decision-making in a global context. This will not only allow for a full valuation of energy, but also exposure to other considerations, and arguably potential solutions to our energy challenges – including different distributional concerns, the need for multi-cyclical temporal investigations (section 7.2.1) and recognition of responsibility (section 7.2.3), for example. Thus, in line with Adams *et al*. (2012), this approach can identify and potentially prevent problems that could arise from unseen and unintended consequences of energy decision-making – in this case, issues of energy justice. This research has demonstrated that a whole-systems framework draws attention to different actors of concern and most pertinently, different scales of justice. In so doing, it provides a framework that may lead to a radical reappraisal of energy sources with appropriate emphasis being given to the justice benefits or dis-benefits of differing sources and the removal of moral blind spots (Jenkins *et al.* 2016a). Arguably, therefore, our concern should not just be for energy justice, but for 'energy systems justice'.

7.2.3 Reflecting on Actors

This section reflects upon the third variable of investigation for this research, actor or in the case of this research, actors. It draws attention to one key knowledge claim emergent from the research findings, the question of 'justice *by* whom?' as it answers RQ3, 'how do the energy justice articulations of elite actors vary between actors?'. It discusses the fact that, in the case studies presented, articulations of 'justice *by* whom?' emphasised that governmental and industrial groups hold a higher degree of responsibility for the provision of energy justice than other actors in the nuclear energy system, including regulators, NGOs and general citizens.

Firstly, in answer to RQ3, 'how do the energy justice articulations of elite actors vary between actors?', the results demonstrated both similarities and differences in

justice as recognition articulations across the two research case studies, as discussed in section 7.1.2 above. This included shared concern by the actors in the Hinkley Point and Sellafield cases for populations affected by radioactive discharges, including workers, local communities, future generations and those affected by health impacts between the actors groups, but differences in each case study over the need to recognise international actors including uranium miners, youth, consumers, tax payers and volunteer host communities for the GDF. Consequently, this approach has drawn attention to new actors of concern. Furthermore, the results show that whilst NGO and policy groups were understood to share responsibility for the production of energy justice, industry and policy respondents are assumed to carry a higher *degree* of responsibility. Within this framework, they are the providers of energy justice, and the NGOs the assessors.

The literature on energy justice has focused on a number of key social groups, including the fuel poor (Middlemiss and Gillard 2015; Chard and Walker 2016; Hiteva 2013; Sovacool 2015; Teller-Elsberg *et al.* 2016; Walker and Day 2012), disabled or unwell members of society (Snell *et al.* 2015; Liddell *et al.* 2016) and ethnic minority groups (Reames 2016). However, the results promote reflection not only on the question of 'justice for whom?', but also on 'justice *by* whom?'. As far as the author is aware, no research to date has explicitly engaged with this question. In discussing this idea of responsibility, the respondents advanced the typical application of justice as recognition, which, generally speaking, has focused on the recipient of benefits or ills only, not on those who create them – an aspect of justice that is very pronounced in climate justice debates (see Bulkeley *et al.* 2013, 2014; Barrett 2013, 2014). In this regard, the respondents highlighted who is perceived to be responsible for remediating injustices, or conversely, ensuring the continuation of just practices. This develops the work of Heffron *et al.* (2015) who identify that the purpose of energy justice is to (1) identify when and where injustices occur, and (2) to identify how best academics and practitioners can critically evaluate the impacts of energy policies and

how best they can respond – thus attributing accountability. Simultaneously however, it prompts a reflection of who the 'practitioners' really are.

In this study, interview respondents reflected both on their own responsibilities and on the responsibility of others, acknowledging therefore that all groups represented – NGOs and policy – are involved in both the production and continuation of energy justice. Nichola Clark explained her own responsibility, for example, in campaigning as part of an NGO on nuclear issues because of her own sense of responsibility to wider society, her children and her as yet unborn grandchildren. This finding coincides with the writings of Sovacool *et al.* (2014: 199), who identify that as each of us participate in the global energy system, each of us contributes to energy injustices as the decisions we make about which electricity company to patronise, for example, have moral and ethical implications. Later they add that our 'moral orientation seems unequal to the task of accommodating energy and climate change problems' and go on to reflect that energy policymaking needs to be directed by justice principles. Sovacool *et al.* (2016: 5) state that contemporary analysts, policymakers and even consumers should reconsider their energy decisions as not only technical, economic or even environmental concerns, but also moral ones.

However, whilst the results demonstrated the shared opinion that everyone has responsibility for the production of energy justice, they also indicate that industry and policy groups are assumed to carry more. Robert Birkenhead, an unattributed respondent in the Hinkley Point Case Study outlined, as an example, that the responsibility for energy justice fell on the industry and the government based on the idea that firstly, the industry want to make money from that station and therefore it is in their interests to ensure that it can do so, and secondly, the government wants to ensure continuity of supply for its citizens. This finding was consistent across both case studies as NGO and policy respondents indicated that certain industry and governmental individuals, including the Secretary of State, and government bodies such as DECC, the ONR, the Department of Business, the Health Services

Commissioner, and the Nuclear Installations Inspectorate, held more influence over energy justice outcomes. Thus, the research findings illustrate that the question is not who is responsible for the provision of energy justice, but who has the highest *degree* of responsibility?

Sovacool and Dworkin (2015) recognise that we need to make energy decisions that promote responsibility, including attention to the minimisation of negative externalities, or energy-related social and environmental costs. They continue that 'this element of energy justice is perhaps the most controversial and complex, as it blends together four somewhat different notions of "responsibility": a responsibility of governments to minimise environmental degradation, a responsibility of industrialised countries responsible for climate change to pay to fix the problem (the so-called "polluter pays principle"), a responsibility of current generations to protect future ones, and a responsibility of humans to recognise the intrinsic value of non-human species, adhering to a sort of "environmental ethic"'. Notwithstanding the truth of these claims, a shift in attention is required from different instances of responsibility to different actors that can take responsibility for them. The indication that industry and policy groups hold a higher degree of responsibility provides promising ground for future research into targeted, practically-oriented approaches to energy justice, including the development of group-specific policy frameworks and economic metrics for example. This call is reflected upon in chapter 8 in the discussion of future research agendas. Consequently, the results advance the energy justice literature, which focuses almost exclusively on those facing injustices, to promote a simultaneous consideration of who has the highest degree of responsibility for the inequity and/or its remediation.

7.2.4 Summary of Findings

Hall (2013: 434) noted the need to 'widen the scope of energy justice…to dislodge debates from where they currently stand…towards a more nuanced understanding

of energy'. This investigation has provided three key insights into this goal as it introduced three key knowledge claims according to the variables of investigation. It has argued firstly, for a more nuanced understanding of temporality in both academic and policy energy justice discourses, cognisant of evolving facility lifecycles and the different justice concerns they raise. This assertion complements and advances the work of Fuller and McCauley (2016: 8) who identify that 'questions of time may be significant in further understanding the impacts of energy justice activism for the future', by adding elite and whole-systems perspectives. Secondly, it has represented a call for whole-systems approaches to energy justice investigations, including consideration of all systems components throughout an energy form's lifecycle as a means of capturing all the justice-related aspects of an energy source. Finally, it has highlighted the necessity of considering the question of 'justice by whom?' as we consider not only those who face injustice, but also who can correct it. In summary, it has presented additional concepts that give new insights into the manifestation of energy justice in practice and in academic scholarship.

7.3 Implications for Nuclear Energy and Energy Transitions

This section offers initial interpretations of the implications of the three key energy justice contributions for nuclear energy scholarship, UK nuclear policy, and the wider energy transitions literature. Retaining a structure based on the three key variables of investigation, time, systems component and actor, it considers the themes of (1) facility lifecycles, (2) systems approaches, and (3) the question of 'justice by whom?'. It advocates for longitudinal social justice approaches at each stage of the nuclear life cycle that can capture changing energy justice discourses through time, an increased emphasis on whole-systems social justice analysis in both academia and policy, and greater integration of justice principles into UK nuclear energy politics and industry strategy.

In the second half, it returns to the literature on socio-technical systems presented in chapter 2 to consider more broadly what this evidence means for wider energy transitions. It re-examines the role of energy justice as a component of the landscape level of multi-level perspective model on socio-technical transitions to challenge the perception that the only means of initiating energy transitions is through the 'novel' and the 'niche'. It reiterates the case that it is within this overarching landscape of socio-technical change that issues of energy justice emerge, where inattention to social justice issues can cause injustices, or alternatively via their inclusion and the resultant pressure on the regime and niche levels of the MLP model, can provide a means to solve them. Throughout, this is positioned as a political process. This section asks, in effect, why do these theoretical contributions matter?

7.3.1 Temporal Energy Justice and Nuclear Energy

Debates around the temporality of nuclear energy are well trodden and typically occur in relation to a number of key issues, including the inter-generational justice concerns caused for example by the longevity of nuclear wastes (Kelly 2015; Wagner *et al.* 2016; Surrey 1992; Hammond *et al.* 2013; Bråkenhielm 2014), sudden catastrophic events (Steinhauser *et al.* 2014; Beresford *et al.* 2016; Danzer and Danzer 2016; Hale 2011; Ahn *et al.* 2015; Wheatley *et al.* 2016) and the dependence of nuclear energy on finite uranium resources (Taebi and Roeser 2012; Taebi *et al.* 2012; Kojo and Richardson 2014). It is recognised that the benefits of nuclear power exist primarily for the present generation, leaving the burdens of long-lived radioactive waste to future cohorts (Taebi *et al.* 2012; Kojo and Richardson 2014; Gardiner 2015; Hansson 2015). However, this has to be taken in the context of all energy sources which all leave waste in some form to future generations. In this regard, issues of temporality are heavily embedded in nuclear energy research as an artifact of its inter-generational justice implications – the negative and positive obligations one generation owes to another as a consequence of its usage (Kelly 2015).

Whilst such a focus is necessary, nuclear researchers should also be cognisant of the evolving lifecycle of nuclear power facilities and the energy justice challenges that these localised transitions provide, thereby incorporating the transition of time at a particular site as part of its lifecycle. This includes the justice implications of all stages of the nuclear lifecycle, from site selection to the eventual closure. Taebi *et al.* (2005) note that most of the literature reflecting on the ethical and societal aspects of nuclear energy has been concerned with its military usage or whether it is morally justifiable as a production source (Routley and Routley 1981; Hollyday 1991; Bertell 1991). Here, the emphasis is on moving past this event and stage-focused framework in nuclear energy research towards more longitudinal approaches.

Such approaches are common in environmental justice studies of uranium mines in particular (see Jenkins 2004; van Eeden *et al.* 2009; White 2013; Renkhoff 2015). This includes attention to the finite lifespan of mines, which, alongside the social ramifications of their operation, carry a range of post-operation challenges. According to the results of African case studies by van Eeden *et al.* (2009), these include the fact that uranium mines are often left derelict and abandoned after usage with implications for polluted groundwater and human health, loss of earnings, and social disruption, the impacts of which can rapidly increase after mine closure when no further funds are available for remediation. Such longitudinal social justice approaches must be mirrored at each stage of the nuclear energy lifecycle. For Jasanoff (2004) this would allow better insights into the epistemic and normative complexity of the nuclear issue (descriptive and explanatory purpose) and its potential to instruct normative policy guidance (prescriptive and moral purpose) as long-term management challenges emerge.

Such longitudinal approaches to social justice concerns are also of direct relevance to UK nuclear politics as they encounter the temporal challenges of the time taken to construct new plants, their production lifespan, decommissioning timescales, the long-term storage of nuclear wastes and long-term transitions away from fossil fuels,

as well as the risk of path dependency, for example. Keay (2016) notes that such issues include the risk of investing in long-lived infrastructural projects, comprising power stations, pipelines, terminals and grids, which increase the risk of infrastructure 'stranding' if and when policy changes. This frequently occurs, as Taylor (2016) illustrates in his exploration of UK nuclear policy's history.

The UK government and industry have strategies that cover all stages throughout the lifespan of one plant – construction strategy (BIS 2013), planning controls (DECC 2011b), operation regulation (ONR 2016b) and decommissioning strategy (NDA 2016), for example. Heffron *et al.* (2015) note that there are a range of practices and regulations in energy and environmental law that respect or protect future generations, reflecting a long-term focus on nuclear waste issues. This includes the ability of the electricity utility industry to defer or anticipate the costs of the project, including construction and decommissioning, so that the generation that reaps its benefit pays for them. This employs the same logic that incurring pollution control costs will prevent emissions in the future (Weston 2008). To this end, Keay (2016) notes that with the goals of economic effectiveness, environmental protection and energy security, UK plans are, to a large extent, long-term oriented. On the whole, however, these strategies are not rooted in attention to the on-going social justice implications of these changes, including remediation of the social disruption caused by their closure. This despite the fact that, as the results have demonstrated, the evolution of nuclear sites should not only be a question of security, finance and environmental protection, but also of social justice.

As its second contribution under the theme of time or temporality, this chapter has called for approaches that incorporate time transitions across the energy system in total as acknowledgement that rather than being a discrete linear system, each stage within the nuclear lifecycle operates simultaneously. It outlined that despite the apparent sense of this claim, the wider literature contains a predominance of linear notions of time. As this chapter now goes on to discuss, not only is the transition of

time not acknowledged across the system within UK energy policy, but neither is the wider system, including the issues of downstream uranium mining.

7.3.2 Whole-Systems Energy Justice and Nuclear Energy

A growing body of research has emerged that investigates the social justice implications of the different stages of the nuclear energy system, including attention to issues of uranium mining (Karlsson 2009; Jenkins *et al.* 2016b; Conway 2013), energy production (Rehner and McCauley 2016; Henwood and Pidgeon 2015), the rehabilitation of contaminated territories (OECD 2006; Till and Grogan 2008) and waste (Bergmans *et al.* 2008; Fan 2006a,b; Krütli *et al.* 2015; Endres 2009; Sovacool *et al.* 2016). However, scholarship across the systems is less common, with few studies outside of this research taking lifecycle approaches to social justice concerns, even within the energy policy literature (Florini and Sovacool 2009). The same is true of nuclear energy policy, which, despite the oversight of international regulatory bodies including the International Atomic Energy Agency and the International Nuclear Regulators Association, is generally developed at a national or sub-national scale (see DTI 2006; BERR 2008; DECC 2013) and often at disparate energy systems stages (see DEFRA 2007, 2008).

Inescapably, however, issues of nuclear justice do not always exist within the bounds of these geographical areas and therefore cannot be dealt with by national governments or local stakeholders alone (Hofmeester *et al*. 2012), a statement supported through the research findings as they discussed the implicated issues of climate change and potential radioactive contamination. Thus, the need for multi-disciplinary research and broader societal involvement in nuclear decision-making is increasingly recommended at national and supra-national levels for all aspects of the nuclear fuel cycle (Schröder and Bergmans 2012; IAEA 2002; Hedemann-Jensen 2004). Alongside the discussion presented in this chapter, and in line with the material presented in Jenkins *et al.* (2016b), the necessity of this approach can be

highlighted using the case of uranium mining. Most prevalent in Australia and Canada, though with increasing input from Kazakhstan, uranium mining commonly occurs on lands owned by indigenous and tribal people (Karlsson 2009; Conway 2013). In such communities, the need to work with minority communities to overcome environmental injustices is widely acknowledged (Martinez-Alier 2001). This includes, for example, damage to human health and the local environment, poor economic compensation, and concerns over sovereignty and indigenous rights (Karlsson 2009; Jenkins *et al.* 2016b; Sovacool *et al.* 2014). Yet this is neglected from UK policy and UK assessments of nuclear energy's viability, despite the policy's obvious knock-on effects.

Indeed, the UK Government, prior to the publication of their Energy White Papers, undertook public consultation, including survey-based consultation, focus groups and deliberative workshops (Stagl 2006). Despite some criticism, such consultation attempts show some attention to justice concepts at a national level (indirectly representing issues of distribution, recognition and procedure). Yet they fail to acknowledge justice manifestations in their systems context, including the upstream impacts of uranium mining and the downstream externality of nuclear waste (McLaren *et al.* 2013; Coplan 2008; Sheldon *et al.* 2015), albeit nearly all energy sources fail to account for down-and upstream externalities, so nuclear energy is no exception. To do so, however, is to regard the decision-making community as homogenous, and neglects the idea that injustices at one scale do not necessarily translate across others (Bickerstaff and Agyeman 2009; Heynen 2003). Moreover, McLaren *et al.* (2013) illustrate that poor-quality participation in specific life-cycle phases contribute to breakdowns in trust in communities affected by that operation, *as well as* to the emergence of justice impacts and conflicts elsewhere in the life cycle as operational nuclear power stations necessitate both mining and waste disposal. Thus, they demonstrate that each stage implicates the other, as found in the research reported here. Consequently, such parochial policy approaches often fail to acknowledge system-wide implications, and as such do not acknowledge all

relevant systems actors, in effect, failing to represent the full social justice implications of nuclear energy.

This suggests that socially oriented whole-systems analysis of nuclear energy is underemphasised in both academia and policy. In line with a growing body of researchers (Florini and Sovacool 2009; Butler and Simmons 2013; van de Graaf *et al.* 2016), these findings support the case for the continued development of internationally governed, whole-systems policy and research. This represents a (somewhat ambitious, but nonetheless necessary) call to broaden perspectives beyond the boundaries of national governments to consider the global injustices that arise as a consequence of the complex relationships in the nuclear system. This follows a growing trend towards considerations of global energy governance (see Heubaum and Biermann 2015; Sander 2016; Monkelbaan 2014; Karlsson-Vinkhuyzen *et al.* 2012; Florini and Sovacool 2009). Through whole-systems approaches to nuclear scholarship and energy policy, other considerations, and arguably potential solutions to our energy challenges, become apparent. As Butler and Simmons (2013: 157) state, 'considering nuclear energy in this more open way would make it possible to see a wide range of approaches and courses of action that contribute to what might be described as more just decisions, processes and practices in the sector'. This includes exposure to different concerns about distributional justice, justice as recognition and procedural justice, all of which are required to evaluate the implications of selecting nuclear energy as an energy source in future energy mixes.

7.3.3 Actor: Attributing Responsibility for Energy Justice in Nuclear Energy

A search of the literature on the role of actors in nuclear energy research illustrates a focus on public, and specifically student, attitudes towards the energy form (Corner *et al.* 2011; Siegrist *et al.* 2014; Arikawa *et al.* 2014; Wagner *et al.* 2016; Honda *et al.* 2014; Stenseth *et al.* 2016; Komiya *et al.* 2008), alongside calls to recognise the rights of particular actor groups in nuclear decision-making, such as those facing health

impacts (Qvist and Brook 2015; Yamashita 2016; Zhu *et al.* 2016; Rahman *et al.* 2013), indigenous communities (Graetz 2015; Jenkins 2004; Acuna 2015; Guerra 2002; Banerjee 2000; Chamaret *et al.* 2007), and future generations (Kula 2015; Taebi *et al.* 2012; Brookshire and Kaza 2013; Kermisch 2015; Kermisch *et al.* 2016; Andrianov *et al.* 2015), amongst others. This suggests an emphasis on groups either positively or negatively affected by nuclear power and an under-emphasis on debates of who is able to solve them.

Whilst it is sometimes acknowledged that nuclear energy is a low-carbon energy source (see Canfield *et al.* 2015, Lee 2013; Ramana 2016; Elliott 2007; Sovacool 2008), Newell and Mulvaney (2013) discuss the frequent presentation of nuclear power as 'clean' energy, without acknowledgement of its social context, including the environmental injustices associated with uranium/yellow cake mining and long-term nuclear waste storage problems (see also Doyle 2011; Karlsson 2009; Jenkins *et al.* 2016b; Conway 2013; Adamantiades and Kessides 2009). They warn of the burdens of nuclear power being unevenly distributed, 'particularly if "clean energy" is pursued without attention to energy justice' (Newell and Mulvaney 2013: 138). In agreement, Turcanu *et al.* (2016) state that research and policy-making in the field of nuclear technologies and radiation protection has been typically grounded on a split between 'technical content' and 'social context', with a strong division of labour between natural and social scientists. As an illustration, Bergmans *et al.* (2014: 2) identify that in the case of radioactive waste management, 'despite a greater involvement of affected communities in decision-making processes, technical aspects are still most often brought into the public arena only after technical experts have defined the "problem" and decided upon a "solution"'. These statements appear consistent with the moral vacuum in energy governance highlighted throughout this research.

This is particularly the case in the UK nuclear context. Throughout its history as a nuclear producer, the UK has experienced widespread opposition to nuclear

development and local objection to the siting of new reactors (Bickerstaff 2008; Mah and Hills 2014; Grimston *et al.* 2014; Henwood and Pidgeon 2015; Herring 2010). Thus, as part of this drive for new nuclear power UK policy has been drafted to draw attention to issues of social inclusion. Stagl (2006) notes that this policy has increasingly emphasised public participation, as governments seek to take more consideration of the opinions of the public on electricity generation techniques. Yet, using the example of nuclear waste disposal as an example, despite attempts to increase stakeholder engagement at all stages of the planning and development process (ICRP 2013), most technical strategies are conducted independently of social or ethical dimensions, which typically come at the later stages of siting due to public controversy (Turcanu *et al.* 2016). As an illustration, in 2006 the UK Government promised a full public consultation before taking a decision on new nuclear build, but through legal proceedings, Greenpeace highlighted that this never happened (Greenhalgh and Azapagic 2009). Such instances, alongside the continued debate over the future of the UK's nuclear waste, highlight the necessity of continued concern for social justice in energy decision-making.

In addition, it is also necessary to consider the role of policy and industry groups – those identified by the interview respondents in this research as holding the highest degree of responsibility for energy justice – in creating this change. Investigations into the history of UK nuclear energy policy (as outlined in section 4.1) illustrate that nuclear power has fallen in and out of favour with UK governments across its approximately 70 year commercial energy lifespan, receiving favour most recently due to the national desire for energy independence, and a long-term shift towards green, low-carbon technologies (Florini and Sovacool 2009; DECC 2011b; Watson and Scott 2009). The Long-Term Nuclear Energy Strategy (DECC 2013) contains no mention of justice concepts. Where they do appear in the 2008 Nuclear White Paper (BERR 2008), they appear only as a concern for the ethical dilemmas of nuclear waste and long-term carbon emission reduction targets. Despite some explicit attention to issues of procedural justice in other policy documents, including most notably the

2007 Planning White Paper (HM Government 2007) and the MRWS process, this suggests a failure to appreciate and engage with the full extent and diversity of social justice implications as outlined throughout this research. The same is true of the industry strategy, shown by the fact that EDF Energy, who own eight of the ten currently operating nuclear reactors in the UK and are leading the developments at Hinkley Point C, fail to include mentions of fairness, equity, justice, morality and like concepts in their strategy documents. This appears to reflect the continued division of 'technical content' from 'social context', as outlined above, and points to the need for greater integration of justice principles into UK nuclear energy politics and industry strategy.

7.3.4 Just Energy Transitions

As outlined in chapter 2, social science perspectives on energy transitions are under-represented in academic scholarship (Guy and Shove 2000; Wilhite *et al.* 2000; Sovacool 2015). Moreover, where they do exist, the economic and geopolitical aspects of energy take precedence (Edberg and Tarasova 2016). Chapter 2 highlighted that a social perspective is required to complement the conventional focus of energy studies on the costs of certain energy choices and technologies in order to fulfil the emergent moral vacuum in energy transitions research. Specifically, it argued that it is within the under-theorised macro-level landscape of the multi-level perspective model on socio-technical systems that issues of energy justice emerge. In light of the research findings, this section briefly re-examines the role of energy justice as a component of that landscape level of the multi-level perspective model to challenge the perception that the only means of encouraging energy transitions is through the 'novel' and the 'niche'. It reiterates the case that inattention to social justice issues can cause injustices, or alternatively via their inclusion can provide a means to solve them, as it considers the implications of the evidence presented throughout this chapter for the energy transitions literature. Most pertinently, it positions this as a political process. Whilst a few studies have

emerged that explicitly address the role of energy justice in the socio-technical transitions literature (Mullen and Marsden 2016; Eames and Hunt 2013; Fuller and Bulkeley 2013; McLaren *et al.* 2013), this is the first to explore the role of energy justice in socio-technical systems models and its political operationalisation.

According to Newell and Phillips (2016), the landscape level of a socio-technical regime comprises structuring forces, including ideologies, institution's discourses, and political and economic trends that constitute enduring forms of socio-technical organisation. It is the role of discourses and institutions that is particularly relevant here as shifts in landscape conditions, such as government intervention in markets or changes in social preferences (Unruh 2002; Dolfsma and Leydesdorff 2009) are understood to create windows of opportunity to disrupt the status quo in, in this case, the mode of energy provision (Li and Strachan 2016). Leiss (1978) offers the example that the rise of consumer culture based on individual definitions of needs, channelled through to expanding commodity consumption. Alternatively, the rise of neo-liberal models of globalisation led to more mobile capital and market deregulation (Smith *et al.* 2005). In these examples, social changes were not targeted at any specific regime – market structures, food production and energy supply, for example – yet brought about selection pressures on the regime. As a further illustration, the climate change agenda is widely recognised for having initiated an energy transition, where its framing at the landscape level encouraged regime actors to pursue low-carbon technologies, many of which appeared through the niche level as new forms of innovation. Energy justice can arguably undertake a similar role, where the reframing of energy decision-making (including whether or not to accept nuclear power) as ethical issues can affect which technologies we select as part of our energy mix. It follows that transition plans need to incorporate notions of energy justice.

This claim is reinforced by focusing on the variable of actor and the idea that governmental and industrial groups hold a higher *degree* of responsibility for the

provision of energy justice. Energy transitions are increasingly recognised as inherently political processes (Meadowcroft 2009; Shove and Walker 2007; Geels 2011; Pollitt 2012; Hess 2014), yet despite this acknowledgement and a few recent attempts to pay greater attention to the role of politics and power in transitions (Geels 2014; Scoones *et al.* 2015), there are few studies scrutinising how political elites represent energy in their rhetoric (Brondi *et al.* 2015; Edberg and Tarasova 2016). Indeed, the transition literature has not thoroughly engaged with the political question of which energy sources are prioritised, by whom and why, and what this means for who secures access to energy (Newell and Phillips 2016). Yet, despite this apparent neglect, Edberg and Tarasova (2016) illustrate the importance of such approaches by showing that politicians consider energy issues in relation to the worldviews they adhere to – according to their interpretations of socio-economic development models and political ideas. In essence, they construct their energy policy based on the interaction of energy and societal matters – the surrounding, and continuously changing public context, and the resultant priorities. Furthermore, Grubler (2012) and Jacobsson and Bergek (2004) argue that energy transitions can be induced by the policies that governments adopt. Accordingly, an understanding of how elites frame energy and energy transitions as moral concerns provides an opportunity to consider moral and ethical dilemmas alongside other political priorities.

Of course, this claim comes with a number of caveats. Firstly, Lawhon and Murphy (2011) suggest that those wielding greater power in the context of the socio-technical system – political and industry elites – are likely to have their own interest favoured unless mechanisms are established to limit their influence. In this case, this may manifest as continued inattention to questions of ethics, morality and justice. In this context, this research points again to the finding that policy and industry groups have a higher *degree* of responsibility, not sole responsibility. Therefore it casts NGOs and indeed, wider society, as the assessors of just energy practices.

Secondly, Eames and Hunt (2013: 50) note that transitions are not the outcome of a change in a single variable – the introduction of a new law, for example – but instead are the outcome of complex, mutually reinforcing changes across several domains that involve societal actors. Indeed, it seems futile to believe that such approaches can foster truly 'just transitions' without the framing of energy justice as a core concern for wider society, and therefore a pressure on a range of regime actors. This follows Turcanu *et al.*'s (2016: 90) claim that 'ethics should both *inform* and *enable methods* of democratic decision-making, policy supportive research and education that would, "by design", generate societal trust', and Taebi *et al.*'s (2012) statement that the ethical acceptability of nuclear energy needs to be a continuous process, in which people's moral emotions need to be included.

Finally, there is recognition of the issue of 'regime resistance' (Geels 2014), where regime dynamics are characterised as stable and locked-in both by regime actors and infrastructure. This leads to the critique that they can be difficult to operationalise for the purposes of informing policy (Markard and Truffer 2009; Genus and Coles 2008). This comes alongside the acknowledgement that varying institutional contexts give rise to very different forms of decision-making and power asymmetries that may influence sustainability trajectories in different ways (Hansen and Coenen 2015; Kern 2011; Kuzemko *et al.* 2016). Consequently, Newell and Phillips (2016) state that governments need to exert authority over market actors to initiate more rapid transitions without detailed attention to the political processes and terrain upon which they play out. Where such issues emerge, quantitative models of energy systems have demonstrated their utility as part of an iterative evidence-based policy process (Strachan 2011), despite the often-simplified representations of actor dynamics and choice behaviour they contain (Li and Strachan 2016; Sovacool and Dworkin 2015). As suggested above this question of responsibility for energy justice provides promising ground for future research into targeted, practically-oriented approaches to energy justice, including the development of group-specific policy frameworks and economic metrics, for example.

7.4 Conclusion

This chapter has discussed the contributions of this research to energy justice scholarship, as well as offering initial interpretations of the implications of its findings. In section 7.1 it drew comparisons between the two case studies of research according to the three tenets of energy justice: distributional justice, justice as recognition, and procedural justice. Following an examination of distributional justice articulations it introduced the concepts of non-nuclearity and NIMBYism on the understanding that (1) energy justice discourses may transcend energy-specific concerns, and (2) research groups moved passed classical pro- and anti-nuclear divides. Under the tenet of justice as recognition, it discussed that energy justice is perceived to affect elite groups, not just poor ethnic minorities. Finally, within the tenet of procedural justice it reflected on the normative contributions of the energy justice model. In essence, this section demonstrated the utility of the methodological approached used and outlined its ability to reveal new actors and issues of concern as well as, in the case of procedural justice, to offer new normative framings of energy justice that can aid future 'just' energy decision-making.

Section 7.2 presented the three key knowledge claims emergent from this research, offering new insights under the three variables of investigation, time, systems component and actor. This discussion contributed to RQ1, 2 and 3 as, in light of the research findings, it considered the emergent themes of (1) facility lifecycles, (2) systems approaches, and (3) the question of 'justice by whom?'. Firstly, in answer to RQ1, section 7.2.1 highlighted not only evolving energy justice discourses, but most pertinently the necessity of considering multi-cyclical notions of time that can capture the transition of time at both site level and across the wider energy system. Secondly, in answer to RQ2 section 7.2.2 argued for a whole-systems approach to energy justice investigations as a means of capturing all the justice-related aspects of an energy source. Finally, section 7.2.3 answered RQ3 by revealing the different actors of concern raised across the two case studies and discussing the question

'justice *by* whom?' as it explored who is perceived to be responsible for energy justice. This discussion provided insights within each of the previously identified areas of development for the energy justice literature outlined in section 2.6, coming full circle to three novel contributions that contribute to filling these gaps.

Finally, section 7.3 considered the implications of the three key contributions for nuclear energy scholarship, UK nuclear policy, and the wider energy transitions literature. Throughout, it advocated for longitudinal social justice approaches at each stage of the nuclear life cycle that can capture changing energy justice discourses through time, an increased emphasis on whole-systems social justice analysis in both academia and policy, and greater integration of justice principles into UK nuclear energy politics and industry strategy. Latterly, it considered the implications of its claims for the energy transitions literature, as originally discussed in chapter 2. Within, it made the case that it is in the landscape level of the MLP model that issues of energy justice emerge, and cast energy transitions as intrinsically political processes. It called for greater attention to the role of politics and power in transitions on the understanding that an understanding of how elites frame energy and energy transitions as moral concerns provides an opportunity to embed justice principles within energy decision-making.

This chapter closes by stating that it is only by comparing nuclear energy with other energy sources, including both fossil fuels and renewables, that it is possible to comment on its true justice nature; whether it is the 'lesser evil' energy justice when it comes to energy provision, or whether it is the definition of injustice itself. Thus, it advocates for an extension of the methodological approach used throughout this research to other energy forms; one of four avenues of further research highlighted in the conclusion.

Chapter 8: Conclusion

This final chapter evaluates the extent to which the research met its aim and answered the overall research question and three research questions. Thereby, it summarises the contribution of the study to knowledge and outlines its contributions to academic thought. It revisits each of the chapters in turn and highlights the core contributions achieved in each. Throughout, it reflects on three main areas of originality and novelty, the key contributions of (1) facility lifecycles, (2) systems approaches, and (3) the question of 'justice by whom?'. Finally, it considers emergent areas of further research as it asks, where next?

This thesis highlighted that in the face of contemporary energy challenges – failures to fulfil social, economic and environmental criteria – a range of transitions frameworks have evolved that focus on the desire to transition towards decarbonised, sustainable energy systems. It outlined that the 'socio-' or social element is frequently missing from transitions frameworks as most of us confront climate and energy risks in a moral vacuum. Ultimately, it sought a means of increasing the consciousness of the ethical dilemmas of energy decision-making in transition models, and carried a conceptual ambition to unite the socio-technical systems and energy justice literatures – a combination that represents the first area of novelty gained through the research. It focussed in particular on the role of energy justice in filling the moral vacuum in transition models, as it makes a case for the concept of energy justice as a tool that can aid ethically defensible energy decision-making.

8.1 Chapter Based Conclusions

Chapter 2 reflected on the model of socio-technical transitions – frameworks employed for understanding and governing energy systems transformations (Foxon 2013). It cautioned against the neglect of the concepts of equity and justice in our

energy decision-making and the wider energy debate, which happens despite the fact that the driver of many energy transitions, sustainable development, is rooted in these core notions.

More specifically, chapter 2 fulfilled two aims. Firstly, it introduced the multi-level perspective (MLP) model for understanding socio-technical transitions, before articulating the contention that it is within the landscape level of the MLP model – the top of three theoretical levels – that issues of energy justice emerge. It positioned nuclear energy as an on-going issue of socio-technical change because of its reframing as a potential means of securing both security of supply and climate change stability – its new 'niche' –, and because of its continued use in 30 countries, and proposed use in another 45 (Taebi and van de Poel 2015). Secondly, it introduced, critiqued and reconceptualised the theory of energy justice, introducing three emergent areas of conceptual growth, (1) time, (2) systems, and (3) actor. These so called 'variables of investigation' formed the basis of the research, guiding its methodological and analytical approaches. It suggested that concepts from ethics and justice provide a structure to think about energy dilemmas, and that all three areas of growth are not explicit enough in current energy justice thinking. Fundamentally, it argued that such an approach provided a means of engaging with the ethical gap in energy research and policy.

Chapter 3 then set out the methodological approach taken. The research investigated elite perspectives around two case studies across the nuclear life cycle: (1) energy production at the Hinkley Point Nuclear Complex in Somerset, and (2) waste reprocessing, storage, and disposal at the Sellafield Nuclear Complex in Cumbria, following the whole-systems approach it advocated for. It sampled representatives from the most prominent NGO and policy groups engaged with the research case studies, employing semi-structured oral history interviews with participants identified through a directed snowballing approach. It sampled elite participants specifically, making the distinction throughout between an elite

organisation and an elite individual. The choice to select elite respondents was taken in order to address a gap in the energy justice literature, which to date most commonly approaches justice issues from a local community, activist perspective. Instead, the research sought to move past the present application to promote a simultaneous consideration of who is responsible for the inequity and/or its remediation. Projecting forward, the inclusion of elite participants is also perceived to increase its potential impact and aid its dissemination, a claim validated by its findings, which highlighted that industry and policy groups as members of the identified elite are perceived to hold higher degrees of responsibility for ensuring the provision, or where appropriate continuation of, energy justice.

Following an introduction to the background of nuclear energy in the UK and each case study in chapter 4, the results were then presented in chapters 5 and 6. Chapter 5 explored articulations of energy justice around the first of the two case studies, the Hinkley Point Nuclear Power Complex in Somerset, UK. Chapter 6 then followed the same format, exploring articulations of energy justice around the second of the case studies, the Sellafield Nuclear Power Complex in Cumbria, UK. Both case studies contributed effectively to the overall research question of the study as they explored how elite actors within the nuclear energy system articulate energy justice, as well as contributing to the research questions as they allowed considered of variations in energy justice according to the time, systems component and actor of concern. The results presented provide a high degree of empirical insight into the emergence of energy justice in practice, alongside the energy justice nature of these specific sites.

Chapter 7 then consolidated the results from chapters 5 and 6, and drew parallels with the wider literature presented in chapter 2. In so doing, it discussed the contribution of the study to knowledge in relation to the study's research questions and the wider literature. It presented comparisons between the two case studies of research according to the three tenets of energy justice, distributional justice, justice as recognition, and procedural justice. Section 7.2 then reflected on the three key

knowledge claims presented. The following paragraphs summarise these contributions, before considering emergent areas of future research.

8.2 Research Question Conclusions

In answer to RQ1, 'how do the energy justice articulations of elite actors vary through time?', section 7.2.1 highlighted both temporally evolving energy justice discourses and the necessity of considering multi-cyclical notions of time that can (1) capture the transition of time at a particular site as part of its lifecycle, and (2) capture time across the energy system in total. These include both circular and linear notions of temporality. It highlighted that energy justice scholarship often appears as a static case study or with attention to new infrastructure only, but that such approaches failed to evaluate and inform energy justice throughout the various stages of that site's lifespan. Thus it warned that such approaches may also fail to address the potential to remediate past injustices at pre-existing sites.

Energy justice scholarship must include attention to the evolution of sites and practices through time. Moreover, the research demonstrated that rather than being a discrete linear system, each stage within the nuclear lifecycle operates simultaneously. This finding emerges in contrast to the wider literature, which contains a predominance of linear notions of time where each stage is treated separately. The thesis advocates multi-cyclical and self-reinforcing notions of systems temporality as acknowledgment of the simultaneous operation of each stage and, therefore, the numerous potential and reinforcing moments of injustice.

In answer to RQ2, 'how do the energy justice articulations of elite actors vary according to energy systems component in question?', the research highlighted extensive differences in energy justice articulations according to the systems component in question. As a consequence, the thesis argues for a whole-systems approach to energy justice investigations – consideration of all systems components

throughout an energy form's lifecycle – as a means of capturing all of the justice-related aspects of an energy source. It argued through its empirical findings and through the early literature-based call for a whole-systems approach to energy justice; but that it is also necessary to look at specific energy systems components and sites as a means of capturing the process and site-specific energy justice nuances that emerge.

The thesis asserts that through a grounded systems-wide approach it is possible to capture both the energy justice nature of specific systems components – energy production, for example – and, as a sum total of these parts, the energy justice nature of a particular energy type. This provides a source-to-sink account of the social impacts of an energy technology's lifecycle. Such a systems-wide focus has two implications: (1) it allows the energy technology to be valued at full cost, and (2) this valuation would affect whether it is chosen as an energy source. Moreover, such an approach will not only allow for a full valuation of energy, but also exposure to other considerations. As this research has demonstrated these considerations may include: different distributional concerns, the need for multi-cyclical temporal investigations, and recognition of responsibility. Potential solutions to our energy challenges may also emerge.

In answer to RQ3, 'how do the energy justice articulations of elite actors vary between actors?', the research considered the question of 'justice for whom?' as it explored who is perceived to be responsible for remediating injustices, or conversely, for ensuring the continuation of just practices. It found that governmental and industrial groups are perceived to hold a higher degree of responsibility for the provision of energy justice than other actors in the nuclear energy system, including regulators, NGOs and general citizens. As far as the author is aware, no research to date has explicitly engaged with this question.

In discussing the idea of responsibility, the research respondents advanced the typical application of justice as recognition, which generally speaking has focused on the recipient of benefits or ills only, not those who create them. This raises the feature that the purpose of energy justice is to (1) identify when and where injustices occur, and (2) to identify how best academics and practitioners can critically evaluate the impacts of energy policies and how best they can respond – thus attributing accountability. Simultaneously, however, it prompts a reflection of who the 'practitioners' really are. Moreover, it shifts the attention from different instances of responsibility to different actors who bear that responsibility.

In summary, this investigation has introduced three key knowledge claims. It argues firstly for a more nuanced understanding of temporality in both academic and policy energy justice discourses, cognisant of evolving facility lifecycles and the different justice concerns they raise. This assertion complements and advances the earlier work of Fuller and McCauley (2016) by adding elite and whole-systems perspectives. Secondly, it has represented a call for whole-systems approaches to energy justice investigations, including consideration of all systems components throughout an energy form's lifecycle as a means of capturing all of the justice-related aspects of an energy source. Finally, it has highlighted the necessity of considering the question of 'justice by whom?', as we consider not only those who face injustice, but also who can correct it.

We can apply early analysis of the implications of these three knowledge claims for nuclear energy scholarship, UK nuclear policy, and the wider energy transitions literature. Based on the three key variables of investigation: time, systems component and actor, the thesis advocates for longitudinal social justice approaches at each stage of the nuclear life cycle that can capture changing energy justice discourses through time; for an increased emphasis on whole-systems social justice analysis in both academia and policy; and for a greater integration of justice principles into UK nuclear energy politics and industry strategy.

More broadly, what does the evidence mean for wider energy transitions? The research challenges the perception that the only means of encouraging energy transitions is through the 'novel' and the 'niche' avenues of the MLP, reiterating the case that it is within the overarching landscape of socio-technical change that issues of energy justice emerge – where inattention to social justice issues can cause injustices or attention can provide a means to solve them. The thesis positioned this downward pressure from the landscape level as a political process, suggesting that the question of responsibility for energy justice provides promising ground for future research into targeted, practically-oriented, approaches to energy justice, including the development of group-specific policy frameworks and economic metrics.

8.3 Reflecting on Nuclear Energy

This thesis has sought to deliver an impartial account of the energy justice themes surrounding nuclear energy, and in doing so it has provided numerous insights that move beyond classical pro- and anti-nuclear critiques. It has explored and revealed the ethical and moral dilemmas that nuclear energy presents. These include and go beyond the ethical concerns outlined by Sovacool, as the results illustrate both classical anti-nuclear injustice arguments – concerns for increased incidents of cancers and radioactive contamination, for example – alongside new discourses which evidence that in some cases nuclear energy is perceived to be an ethically defensible choice. This comes as recognition of its ability to contribute towards low-carbon targets, and to offer a boost to jobs and economic prosperity in relatively deprived local areas.

Moreover, the research results have demonstrated that in instances where the distributional risks were not always related to nuclear energy itself (as was the case with the Hinkley Point case study), it was the justice issues raised as an outcome of recognition and procedure that shaped opinions towards the energy form. Here, discourses of 'injustices as risk' were absent. In addition, through the case study of

waste management, storage and disposal the results have demonstrated that whether or not new power stations are built, there must be on-going concern for the justice implications (both positive and negative) of nuclear energy's waste legacy. Thus in the light of the energy justice evaluations presented, even if nuclear energy is not deemed to be ethically sound in terms of energy production, it is continually important.

Arising from these discussions, this thesis has considered the question of whether the morality of risk or the morality of carbon reduction is the more important. It argues, almost implicitly, that the latter represents the most pressing concern for society, and that this feature supplies a means of justifying the nuclear case. However, it is only by comparing nuclear energy with other energy sources, including both fossil fuels and the renewables specifically designed to contribute to this low-carbon target, that it is possible to comment fully on nuclear's justice-related aspects. That is: whether nuclear is the 'lesser evil' when for energy production when compared to other energy forms, or whether it is the definition of injustice itself. As such, it is clear that it is necessary to extend the methodological approach used throughout the research to other energy forms.

8.4 Agenda Setting: Areas for Future Research

Alongside a series of contributions to the socio-technical systems and energy justice literatures, four areas of further research have emerged which can be broken into broadly methodological and impact agendas. These opportunities build on the strong foundation of empirical findings and publications already produced (Appendix 7).

Firstly, the research took place under both time and financial restrictions, eliminating the possibility of investigations into energy justice discourses around uranium mining in Canada and nuclear energy production in the United States, as was originally planned. These limitations detracted somewhat from the overall aim for an

international, whole-systems approach. Thus, expanding methodologically, future research could engage with international examinations, including particularly an investigation of the missing uranium mining case. In so doing, there is potential to close the energy systems loop and develop the source-to-sink energy justice evaluation that the research advocates.

Further, there are limitations not only in terms of systems scope, but as outlined above in the singular nuclear energy focus. Thus, future research could use the methodology to engage with other energy types. The real potential is to create 'energy justice accounts' that allow comparisons between the social justice implications of our various energy sources, aiding evaluations of whether they should form part of energy mixes.

A second methodological development arises from the opportunity to obtain more discrete research samples. Access to certain groups – primarily policy and industry – was limited, and as a result the decision was made to combine industry and policy perspectives in the results chapters under one sample. Although care was taken not to conflate policy and industry perspectives within the grouping, their treatment as stand-alone participant samples would have created more nuanced findings. Thus, future research in the area would benefit from not only a wider sample, but also a better-defined one.

Conceptually, more work could also usefully engage with normative constructions of energy justice, and the potential for the energy justice framework to become a visioning tool through which we construct ideals of just energy futures that can inform our decision-making now. This assertion builds on the results, which demonstrate that in describing potential improvements to procedural systems and giving insight into how procedural justice might materialise, respondents drew attention to the core values that underpinned these mechanisms: openness, transparency, knowledge transfer, knowledge independence and the order of

decision-making amongst them. The emergence of these core notions develops the work of Sovacool and Dworkin (2015) who identify availability, affordability, due process, good governance, prudence, inter-generational equity, intra-generational equity and responsibility as central energy justice principles.

Sidortsov and Sovacool (2015) note that the energy justice concept is only starting to emerge in legal and policy literature. Miller *et al.* (2015) identify three decision-making areas where it is possible to enact socio-economic approaches that are conscious of ethical dilemmas: (1) the practices and techniques through which potential energy futures are envisioned, modelled, analysed, and evaluated, (2) the forums and methods for deliberating, debating, and making energy choices, and (3) the institutions for fashioning, operating, and regulating new energy systems. The energy justice framework has extensive potential to contribute to each of these fields.

Thus one of the most exciting avenues for further development arising from this research is to contribute to mainstream policy-making and develop practical models that align with and add to transition frameworks. This includes the potential to develop a social justice inventory as one might a carbon inventory, with implications for how we view the entire energy system. This follows Sovacool and Dworkin's (2015: 441) call for the design of modelling or quantitative metrics or indicators that can measure energy justice for the energy studies community. As Stern *et al.* (2016) suggest, identifying influences beyond those typically included in policy analysis offers significant opportunities for action, including notions of justice and fairness as non-economic motives for change.

8.5 Closing Remarks

In a review of 15 years worth of energy scholarship, Sovacool (2014) identified that energy research had been dominated to date by science and economics, and as part

of a wider agenda to increase attention to social science contributions to our energy debates he identified energy justice as an important area of future research. Sovacool *et al.* (2016: 552) later stated that 'energy system interventions are about more than technology and economic development; they are about political power, social cohesion, and even ethical and moral concerns over equity, due process, and justice'.

In developing this research topic, the results have contributed to a growing body of academic work that advances the idea that concepts from ethics and justice provide a structure to think about energy dilemmas. The author hopes that they have served as a timely contribution to both the formation and the proliferation of the energy justice concept. The thesis sought to fill (at least partially) the moral vacuum emergent in energy transition frameworks, making the case for energy justice as a tool that can help energy decision-makers to not only mitigate environmental impacts of energy production via socio-technical change, but to also do so in an ethically defensible, socially just, way.

The research met its original aim, offering both conceptual and empirical contributions to both the socio-technical systems and energy justice literatures. It is hoped that the findings will inform justice in practice, presenting knowledge that is essential for understanding the ways in which energy justice is constructed, understood, and tackled across a range of scales. In addition, by introducing areas of further research, it is hoped that it will leave a fruitful legacy beyond this PhD.

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Appendices

<u>Appendix 1</u> - Semi-structured Interview Questions

Theme	Question	Justification
Definitions	At this stage, could you please explain what you understand by energy justice? Please feel free to identify key themes or provide a definition.	
Distribution	Many people object to energy developments on the basis of siting worries. What do you think are their main reasons for doing so?	
	Do you think these opinions or concerns have changed over time?	
	Simultaneously, there is a drive towards localization and globalisation of energies. At what scale should we be concerned about the distribution of energy infrastructures? Local, national, international?	
	Do you think Sellafield should continue to handle waste from overseas? Why?	
	Distributional concerns often revolve around the negative aspects of energy, should we be fighting for positive benefits too?	
	Can you identify any UK communities you feel are disproportionately affected by nuclear waste issues? This may be positively or negatively.	
	Sellafield has played a fundamental role in the UK nuclear industry for years; do you think it should continue to do so?	
Recognition	The environmental justice movement stems from the belief that poor, often colored communities	

	often carried disproportionate burden of environmental ills. In your opinion, are any groups of society unfairly pressured or privileged?	
	Who do you consider to be an energy stakeholder? Are any groups more prominent than others?	
	Has this changed over the past 20 years? Is society in general more or less engaged with energy?	
	How, if at all, should we recognise the views and rights of people at other stages of the energy system? Uranium mining, for example.	
	What or who drives your stakeholder engagement initiatives? Organizational values, the government, or communities?	
	Nuclear waste has an extremely long active lifespan. Should we consider and recognise future generations when making our energy choices? Is it feasible to do so?	
Procedure	Do you think the public has the right to be part of energy decisions? Why?	
	At what stage of the process? Determining the energy policy strategy and consent for individual sites, for example.	
	Should we have any say or involvement in decisions made outside our national boundaries?	
	What form should this engagement take?	
	In some cases the government may choose to override local opposition to energy developments.	

	Do you agree or disagree with this?	
	Sellafield Ltd runs several community engagement schemes including public meeting and charity events. Do you think these are effective or sufficient? How would you improve them?	
Systems	If you could start from scratch, how would you design a just energy system?	
Definitions	Following our discussion, has the way that you'd define energy justice changed? Again, please feel free to identify key themes or provide a definition.	

University of St Andrews

University Teaching and Research Ethics Committee

School Of Geography And Geosciences

10th October 2014
Kirsten Jenkins
Geography and Geosciences

Ethics Reference No: Please quote this ref on all correspondence	GG11168
Project Title:	Discourses of Energy Justice: The Case of Nuclear Energy
Researchers Name(s):	Kirsten Jenkins
Supervisor(s):	Dr Darren McCauley

Thank you for submitting your application which was considered by the Geography and Geosciences School Ethics Committee on the date specified below. The following documents were reviewed:

1. Ethical Application Form — 30th September 2014
2. Participant Information Sheet — 30th September 2014
3. Participant Consent Form — 30th September 2014

The University Teaching and Research Ethics Committee (UTREC) approves this study from an ethical point of view. Please note that where approval is given by a School Ethics Committee that committee is part of UTREC and is delegated to act for UTREC.

Approval is given for three years. Projects, which have not commenced within two years of original approval, must be re-submitted to your School Ethics Committee.

You must inform your School Ethics Committee when the research has been completed. If you are unable to complete your research within the 3 three year validation period, you will be required to write to your School Ethics Committee and to UTREC (where approval was given by UTREC) to request an extension or you will need to re-apply.

Any serious adverse events or significant change which occurs in connection with this study and/or which may alter its ethical consideration, must be reported immediately to the School Ethics Committee, and an Ethical Amendment Form submitted where appropriate.

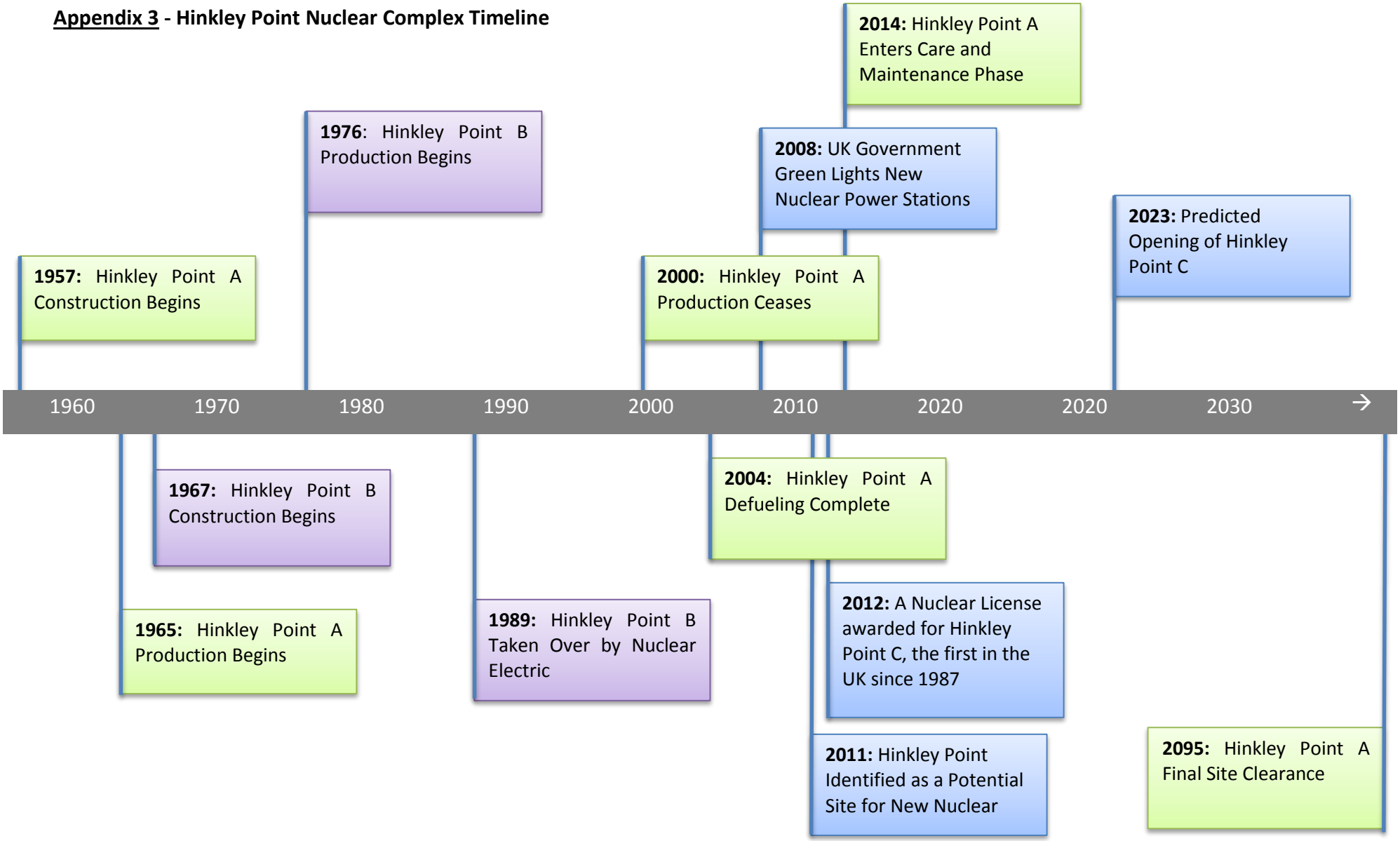
Approval is given on the understanding that the 'Guidelines for Ethical Research Practice' (http://www.st-andrews.ac.uk/media/UTRECguidelines%20Feb%2008.pdf) are adhered to.

Yours sincerely,

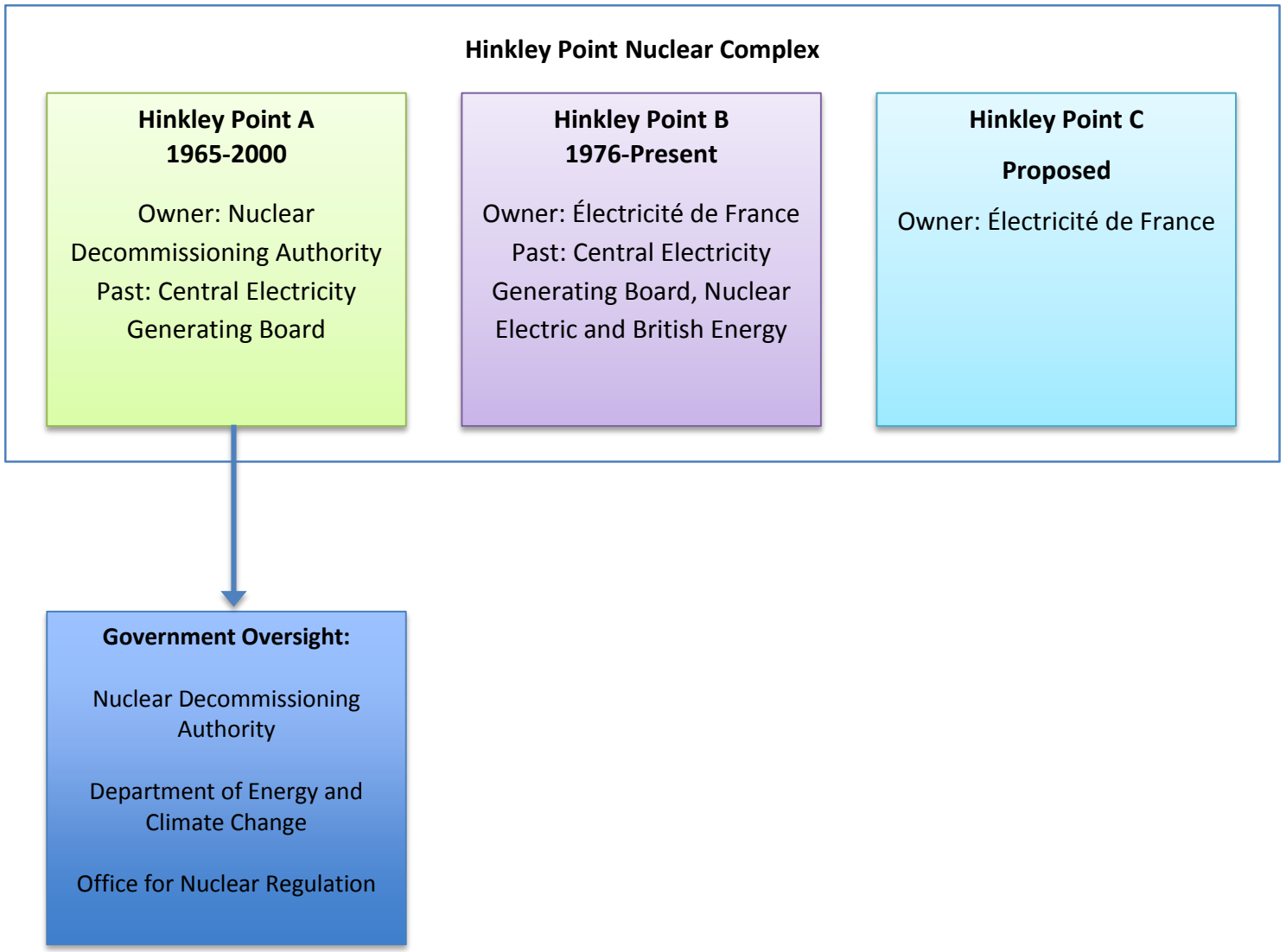
Dr. Matt Southern
Convenor of the School Ethics Committee

UTREC School of Geography and Geosciences Convenor, Irvine Building, North Street, St Andrews, KY16 9AL
Email: ggethics@st-andrews.ac.uk Tel: 01334 463897

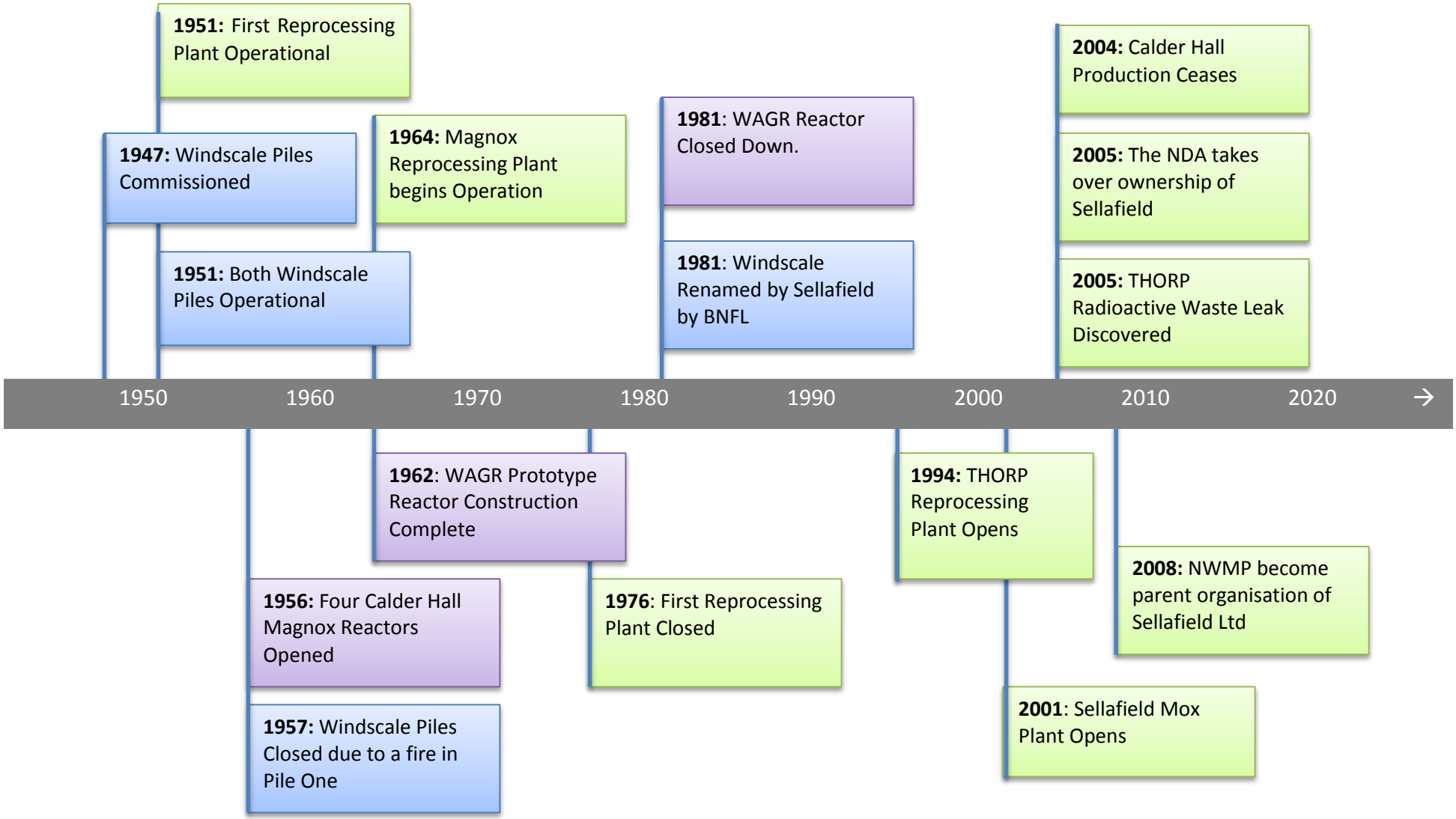
Appendix 3 - Hinkley Point Nuclear Complex Timeline



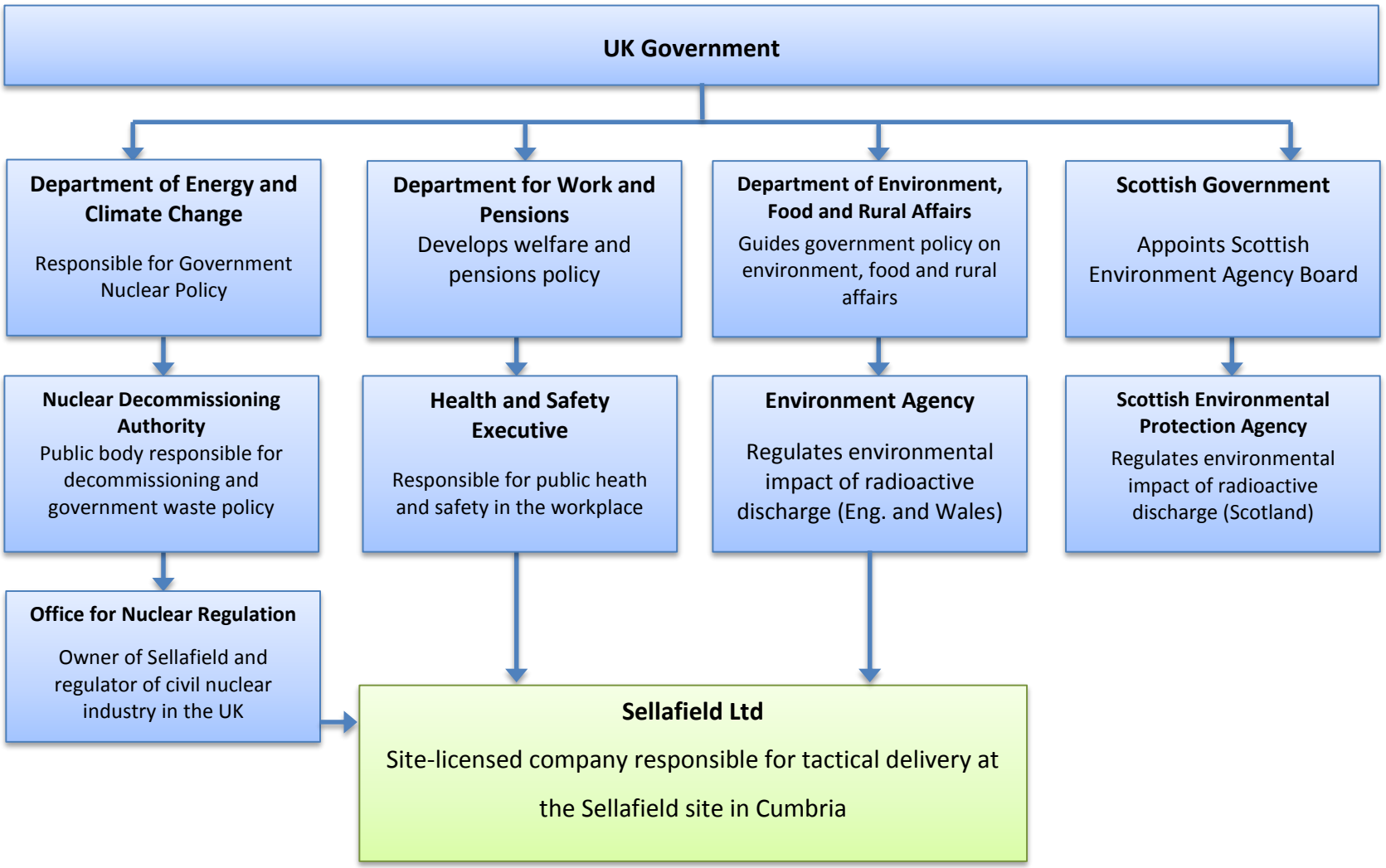
<u>Appendix 4</u> - Hinkley Point Nuclear Complex Ownership and Oversight Structure



Appendix 5 - Sellafield Nuclear Complex Timeline



Appendix 6 - **Sellafield Nuclear Complex Ownership and Oversight Structure**



Appendix 7 - Publications and Presentations Undertaken During the Studentship

Publications

Jenkins K, Heffron R and McCauley D (2016) 'The Political Economy of Energy Justice: A Nuclear Energy Perspective' in Van de Graaf T, Sovacool BK, Ghosh A, Kern F and Klare MT (Eds.) 'The Palgrave Handbook of the International Political Economy of Energy', *Palgrave Macmillan*

Jenkins K (2016) 'Sustainable Development and Energy Justice: Two Agendas Combined'. In Heffron R J and Little G (Eds.) 'Delivering Energy Law and Policy in the EU and US', *Edinburgh University Press, Edinburgh*

Jenkins K, McCauley D, Heffron R, Stephan H and Rehner R (2016) 'Energy Justice: A Conceptual Review', *Energy Research and Social Science* 11: 174-182

Jenkins K and McCauley D (2015) Book Review 'Energy Security, Equality and Justice'. *Energy* 83: 805-806

Jenkins K and McCauley D (2014) 'A forgotten Issue? Nuclear Concerns', *The Geographer, Royal Scottish Geographical Society*

Jenkins K, McCauley D, Heffron RJ and Stephan H (2014) 'Energy justice, a whole systems approach', *Queen's Political Review* 29(2): 74-87

McCauley D, Heffron R, Stephan H and **Jenkins K** (2013) 'Advancing Energy Justice: The Triumvirate of Tenets', *International Energy Law Review* 32(3): 107-110

Heffron R, McCauley D, Johnston A and **Jenkins K** (2013) 'Policy delivery for low carbon energy infrastructure in the UK, April 5th 2013: Conference Overview', *Energy Policy* 61: 1367-1369

Presentations

Oct. 2016	Presenter: Weekend intensive lecturing. Legal Studies Department, International Hellenic University, Thessaloniki, Greece
Sep. 2016	Session Convenor and Presenter: Exploring the Energy Justice Nexus, RGS-IBG Annual International Conference, London
June 2016	Presenter, SENIX 2016: The Role of Social Sciences in a Low-Carbon Energy Mix, Stockholm, Sweden
May 2016	Guest Seminar, Macquarie University, Australia
	Guest Seminar, University of Wollongong, Australia
	Guest Seminar, University of Sydney, Australia
	Guest Seminar, University of Technology, Sydney, Australia
Mar. 2016	Presenter, Ethics of Energy? Fragile Lives and Imagined Futures, St Andrews
Dec. 2015	Presenter, EnGRG Postgraduate and Early Careers Workshop, York
Sep. 2015	Presenter, RGS-IBG Annual International Conference, Exeter
Feb. 2015	Presenter, University of Eastern Finland Energy Transitions Conference, Joensuu
July 2014	Presenter, Fuel Poverty Research Symposium, Queens University Belfast
June 2014	Session Leader, Scottish Graduate School of Social Science, Edinburgh
Mar. 2014	Presenter, St Andrews Rotary Club Schools Forum, St Andrews
May 2013	Presenter, Landscapes of Conflict Conference, University of Stirling
July 2012	Presenter, Green Revolutions: Environmental History Workshop, St Andrews
June 2011	Presenter, World Resources Forum Presentation, Davos, Switzerland
July 2010	Presenter, Department of State, Washington DC, United States